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César Ducruet, Ok-Ju Jeong

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F · O · R · E · W · O · R · D

FOREWORD

It is great pleasure to see the completion of this research report, *European Port-City Interface and its Asian Application* co-authored by an international research team. This is because I believe that the report might be interesting to readers in many ways since, while its focus is not only the port functions, it also examines their linkages with the urban spatial aspects. I believe the following three aspects of the report are especially attractive to readers.

Firstly, the scope of the research extends across Europe and Asia, facilitating the understanding of the two continents that are very different from each other in terms of geography, history and economic integration. The research well demonstrates that the study of port cities is important for the understanding of regionalisation and globalisation processes. The research highlights several functional differences between ports by using relevant statistical tools and maps of high quality to address the spatial logics of port-city concentration and specialisation.

Secondly, the statistical analysis performed in the study is very efficient to show that it is possible to make a quantitative comparison of two large areas: the comparison of 127 cities was made possible through 13 indicators which is a valuable scientific result in itself. The lack of data sources that makes an international comparison difficult has been overcome in this study even if there are always problems to be further addressed in the future research such as the measurement of urban functions (e.g. industrial and service sectors).

Thirdly, the comparison between the study results of Europe and Asia including the Korean case brings interesting implications for solving specific problems with the ports. The study examines European experience where the impacts of maritime trade on local urban settlements and the spatial problems arising from the growth of urban and maritime activities, which Korea have been also experiencing since the 1970's, are well demonstrated. Specific urban problems with the ports of Marseilles, Rotterdam, Liverpool and Le Havre and the solutions have political implications for Korean port development policies.

I hope this report will be useful for those who are interested in port development, urban planning, trade and logistics in Europe and Asia. It is certain that in the context of increasing globalisation, an international analysis of this kind will be helpful to understand the trend in which port development is promoted beyond nations and even continents.

Lastly, I would like to express my deep appreciation and my congratulations to the two researchers, Dr. César Ducruet, French transport specialist, and Dr. Okju Jeong, research fellow of KRIHS, who have come up with this report together. With this study, they have contributed to enforcing the international cooperation which KRIHS is entirely committed to. My final thanks go to other researchers in and outside KRIHS who have contributed to the quality enhancement of the research with their precious comments on it.

December 2005
Byeongsun CHOE
President, KRIHS

S · U · M · M · A · R · Y

SUMMARY

This research focuses on the spatial logics of port-city relationships in Europe, to be compared to the Asian and, in particular, the Korean case. The main goal is to propose some reflections from which Korean players may put their strategies in perspective. Five steps compose the body of the report. First of all, the first chapter recalls the European and Asian stakes of port-city relationships, allowing to formulate some hypothesis on the two areas' specific structures, to be verified later in following chapters. The second chapter proposes a review of academic literature in order to clarify the "port city" concept, given the theoretical and practical lacks on this issue in spite of numerous previous works. The third and fourth chapters are the core of the research, assuming respectively a quantitative analysis (presentation of the data and methodology, factor analysis, cartography of the results and typology), and a qualitative analysis (a smaller sample of eight port cities is chosen and compared through graphical models). The fifth chapter proposes to apply the same methods on an Asian sample, and finishes on centring around the Korean case. Finally, the sixth chapter gives some conclusions to the research, together with some policy implications for the Korean case, through the idea of necessary complementarity and equilibrium between port and urban spaces and functions, so as to cope with the growing pressures from international transport.

Chapter 1: Introduction

The main question raised derives from earlier works on the specific problems concerning the Korean port cities of Busan, Gwangyang and Incheon, regarding globalisation and regional integration processes to which Korea has been increasingly taking part. Herein authors seek to deepen the understanding of port-city stakes in Korea, by widening the usual framework. In particular, the focus is placed on the functions of European port cities and on the comparability with Asian ones in general.

Starting from a view on growing similarities between Europe and Asia, we propose a number of hypothesis on the particularities of the two areas. For example, the core-periphery model underlying port-city relationships in Europe is based on mainland concentration of markets, whereas in Asia, urban coastal concentration leads to very different issues. Moreover, the European spatial and economical ongoing integration allows the existence of a continental port systems while in Asia, ports continue to be mostly local and national-based (e.g. the "colonial" model of entrepots). As a result, most of European port cities are very dependent from mainland, that in turn reduces their own centrality and radiance in the European city system and accentuate their relative transport and logistic specialisation. However, in Asia, like in most southern hemisphere countries, the port-city concentration allows the existence of more multifunctional nodes, such nodes suffering from growing congestion (rapid growth and lack of space). In spite of dissimilar regional stakes between the two areas, we point at the possibility to benchmark local territorial policies thanks to a common conceptual ground.

Chapter 2: Past works on port-city relationships

It appears that both geographers, planners and economists haven't formulated yet a consensual definition of the port city. Despite this lack, and by using the concepts of "centrality" and "intermediacy", we propose some general research directions based on two complementary trends which are spatial dysfunction and functional combination. This research is thus also providing a framework aiming at facilitating international comparisons, still not well developed compared to the large amount of monographs and national case studies.

By defining such a framework, we pay a particular attention to quantitative analysis, which is again very limited about such issues.

For example, the works of IRSIT and the “Air & Sea” team on the European case have proven the possibility to launch large-scale comparison studies. Our research is also inspired from a recent study of 330 port cities at a global scale, crossing both urban and port variables and demonstrating the importance of regional structures on individual places.

Chapter 3: Quantitative approach of European port-city interface

A sample of 69 port cities has been chosen, regarding the threshold of 200,000 inhabitants and participating to container trade. Thirteen variables have been chosen to measure urban functions (administrative, metropolitan and suburban population, railway and highway connexions) and transport functions (container-related activities, forwarders and logistic agents, port infrastructures, maritime services and throughput). From such data, a factor analysis in conducted, with 4 factors concentrating 80% of information: port-city concentration, opposition, combination and specialisation. The cartography of the results allows to show the spatial logics which are more or less homogenous. For example, this confirms the clustering of specialised ports with low urban radiance close to inland markets (e.g. northern range from Le Havre to Hamburg), as well as a north-south division funded on the unequal importance of local economies for accompanying maritime trade. The final crossing of the four factors provides four types of port cities: “gateways”, specialised in transport functions and having limited radiance (e.g. Antwerp, Le Havre, Genoa); “general cities” whose port function is limited compared to other urban functions (e.g. Dublin, London, Oslo); “maritime cities” associating an efficient port function within a diversified urban settlement (e.g. Barcelona, Bordeaux, Liverpool) and the “intermodal cities”, combining sea-land accessibility and logistic functions (e.g. Rotterdam, Marseilles, Piraeus).

Chapter 4: Qualitative approach of European port-city interface

From precedent results, a choice of 8 port cities is made to focus on the internal organisation of the nodes themselves. Some graphical methods introduced in Chapter 1 are applied here to the cities of

Barcelona, Gdansk, Genoa, Le Havre, Liverpool, Marseilles, Rotterdam and Southampton. An important amount of information is synthesised through spatial models, like urban and port networks (regional level), urban morphology, intermodality, port-city combination (local level). Such approach allows to measure the gap between each port city and a general European model. In particular, planning strategies and development projects at the port-city interface are represented spatially to underline their possible impact on the whole port city's structure.

Chapter 5: Application on Asian case

The same methods than for Europe are applied to an Asian sample of 57 port cities, in two steps: factor analysis (quantitative approach) and graphical modelling (qualitative). Finally, a cross analysis of Europe and Asia is led.

Globally, the structure of the main four principal components (83% of information) is very similar to the European structure. The maps show some interesting clusters like the Asian corridor (Singapore – Korea), the Japanese specificity (urban-port mass), as well as some ongoing processes like the port-city combination (China, India). For Korea, a similar profile shared with North-East Asia is based on land-sea accessibility, as opposed to the economic radiance (and limited accessibility) of southern Asia.

The qualitative analysis, concerning only two Korean cases (Busan and Incheon), allows to bring some evidence on the ongoing change occurring within port-city interface. The spatial logic of planning projects (new terminals, free trade zones) is more characterised, compared to the European case study, by a bursting of functions even beyond metropolitan areas (lack of space and land use pressure).

Finally, the crossed Europe – Asia analysis is vital for showing directly the fundamental differences between the two areas. Factor analysis is similar to former individual analysis, but the maps accentuate some aspects such as the logistic specialisation of port cities neighbouring inland markets in Europe, the lack of land-sea accessibility in Asia, and the sub-regional clustering allowing to compare southern Europe / North-East Asia and northern Europe /

southern Asia. One main result is that the “major” nodes of the two areas are not easy to compare as they do not share the same functions.

Chapter 6: Conclusion: policy implications

Viewed from the European “mirror”, Korean port cities are addressed some implications in terms of advantages, limits and stakes.

It first appears that the Korean port cities studied (Busan, Incheon and also Ulsan) are characterised by a dominant port function at a local level, which strongly influences their economy compared to other cities where other functions are able to develop in greater importance (e.g. service sector). This trend is shared by most of the biggest European and Asian ports. However, the lack of land-sea accessibility and the relative superior importance of infrastructure mass vs. economic (and/or logistic) effectiveness are potential brakes to a increased participation to Asian regionalisation and globalisation processes in general. The risk for Korean port cities is to become unattractive urban areas that port function is not – anymore – able to dynamist, notably given the pressures from Seoul and the neighbouring countries’ port-industrial growth poles.

The local focus on Busan and Incheon territorial change, even basic, allows to assess the possibility for the ports to diversify, at the condition of an increased physical port-city separation. Thus, like in numerous cases, the gain in urban centrality and the sustain of an efficient port activity within such urban areas has to undergo physical separation. But to separate urban and port functions does not mean to forget any integration process at a wider scale, in spite of growing spatial distance. Then, the necessity to connect ongoing projects (new terminals, free trade zones) to the inner former structure of cities seems vital for long-term policies.

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1

INTRODUCTION

This first chapter focuses on ongoing major spatial and economic trends affecting port cities. Global forces have to cope with regional specificities, especially in Europe and Asia, for which some hypothesis of port-city organisation are proposed before presenting the overall organisation of the research.

1. Globalisation and the emergence of common challenges in Europe and Asia

1) Ports between maritime and urban systems

With respect to port cities, globalisation have some similar effects of concentration and congestion, and "*many port cities (…) stand among the most environmentally degraded cities in the world*" (OECD, 2004). On the one hand, international economic players (e.g. shipping lines) develop worldwide networks by selecting efficient ports and terminals with similar criteria in a context of free market (Slack, 1993), but on the other hand there is a unique local combination of players in each port-city community.

A common challenge in Europe and Asia is then arising since the container revolution and the increase of inter-regional maritime trade. Port cities tend to develop similar strategies despite their own historical and cultural heritage. In a competitive environment, every port city aims at diversifying its activities so as to reduce its original dependence upon port activities. Diversification and specialisation appear to be closely linked in the case of port cities, for which the basic activity is increasingly uneven, and cannot bring sufficient benefits to the local economy. However, port cities usually keep a specific economic, social and cultural identity compared with non-port cities (Cartier, 1999). Our research argues that urban and port functions have different levels and ways of combination, but are still dependent to each other to some extent.

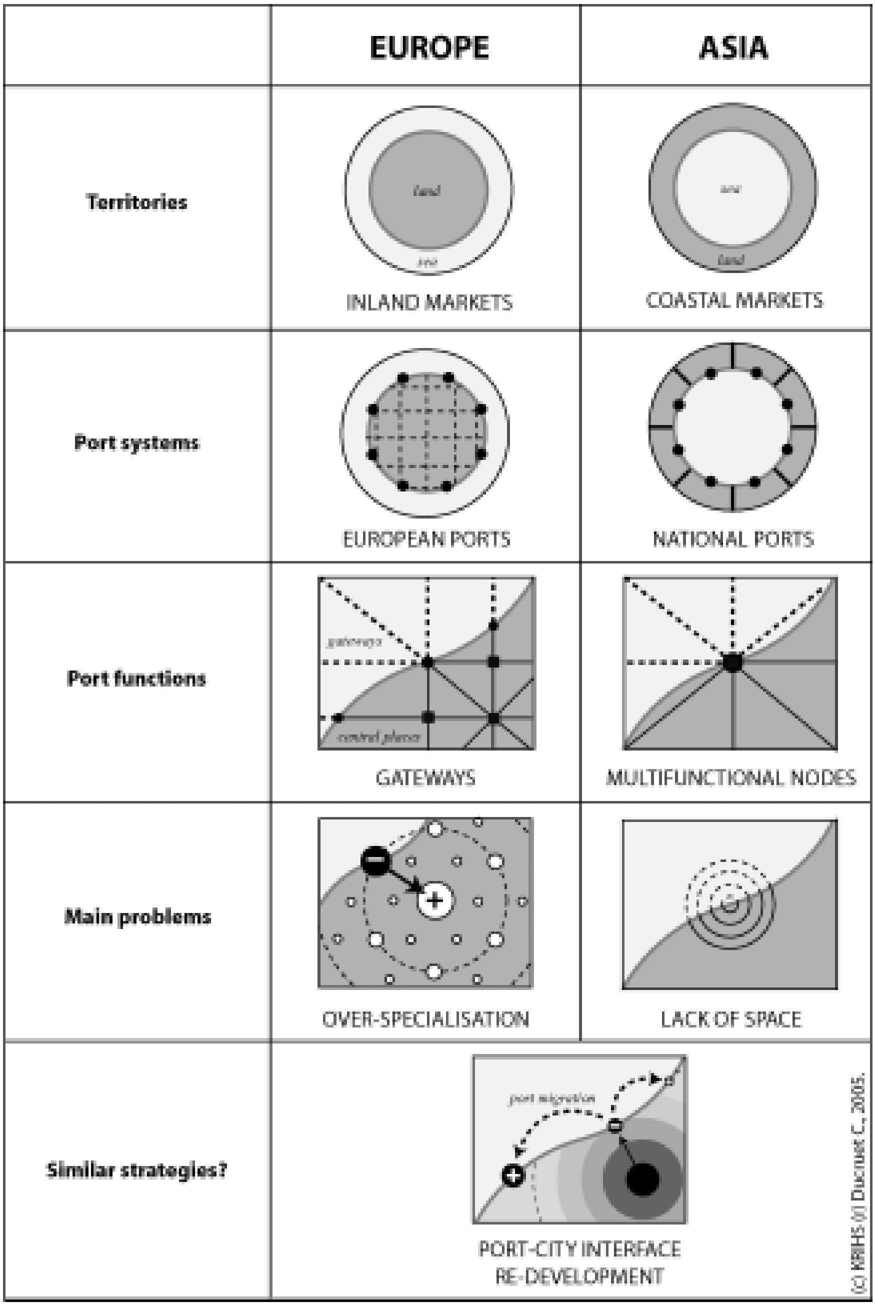
The main purpose of this research is to compare European port cities to each other so as to underline some fundamental regional and local features in the recent period. It takes place after other works on port-city relationships at other geographical scales. The comparison with Asia, which is a smaller contribution here than for the European case, shall bring useful insights for benchmarking Korean port cities' position and address the key differences and similarities between the two continents. A particular importance is given to illustrations (figures, maps), that condense ideas and results regularly along the report.

2) Regional differences of port-city organisation

There is a lack of comparative studies between Asia and Europe, as local, regional and national contexts are usually seen too much dissimilar. However, some hypothesis can be addressed (see Fig.1-1). The main question raised is that despite different spatial structures of the continents in terms of geographical organisation ("territories"), hinterland and transport systems, European and Asian port cities might show similar local strategies, so as to sustain and/or increase their position within logistic, port and urban systems. For example, the 'sea' has a greater importance in Asia (coastal markets and settlements) than in Europe (inland markets). One question of the research is then to understand how continental structures are affecting individual strategies and projects. If the common goal of port cities is to become a multifunctional and diversified node, each place might be constrained by regional structures at varying degrees.

According to varying integration levels of regional economies ("port systems"), European territory is becoming one single market and hinterland served by multiples ports, thanks to the free circulation of goods, while Asian ports are still serving national economies for a large part of their activities.

<Figure 1-1> Hypothesis on European and Asian spatial structures



Asian port cities have been concentrating a wider set of functions ("port functions") as an effect of close hinterlands (multifunctional nodes), while the major function of European ones is often to serve remote hinterlands (gateways).

Some specific consequences of these spatial organisations ("main problems") may be stressed by recurrent problems such as the 'lack of space' for Asian port cities, resulting from coastal concentration, and the 'over-specialisation' for European ones, an effect of inland concentration that increases the relative importance of transport functions within coastal cities' local economy.

Similar strategies: however, port cities in both regions are searching for new opportunities which can be reached by 'redevelopment' policies at the port-city interface. Thus, similar policies and players might be emerging from differing spatial structures and contexts.

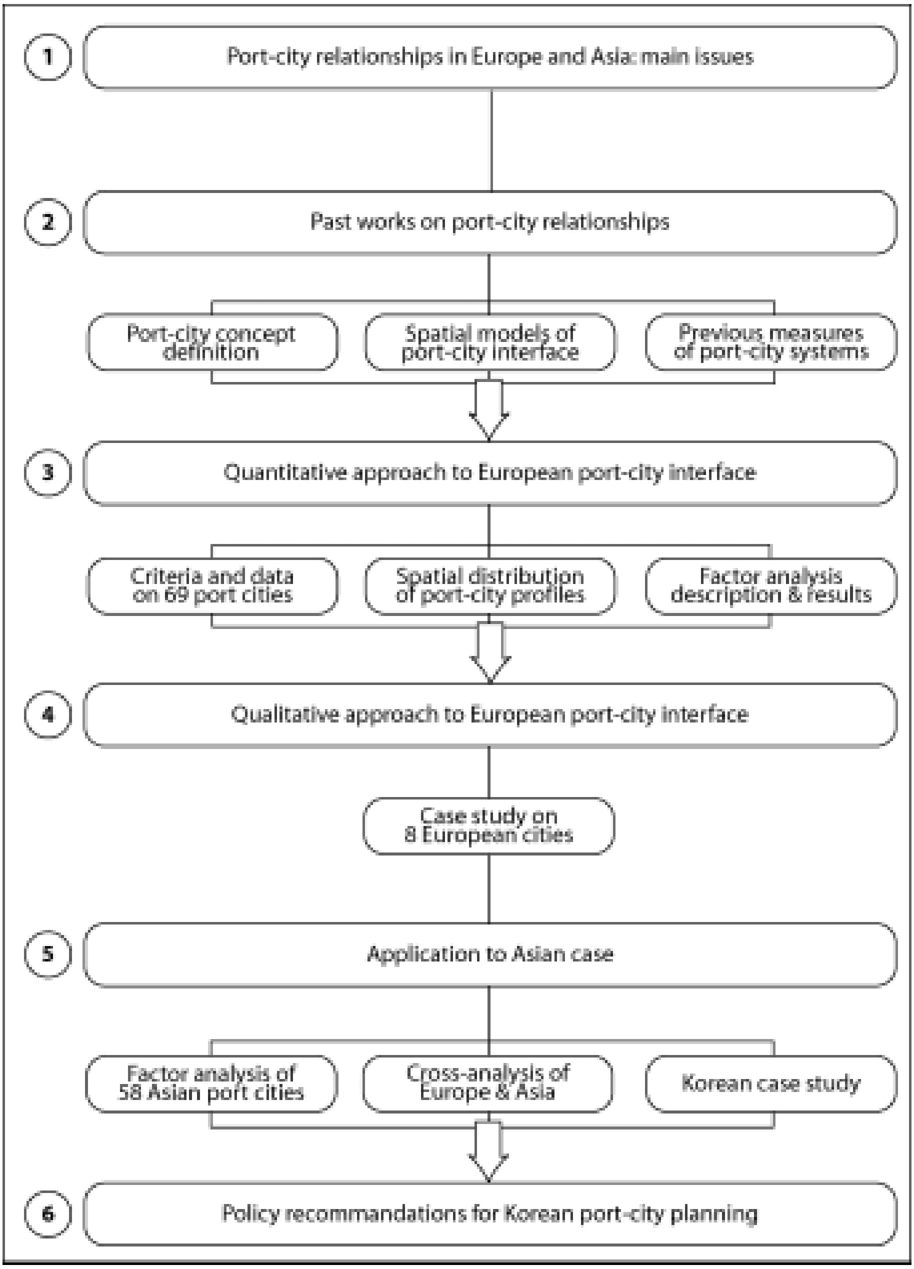
2. Organisation of the research

1) A review of previous research on port cities

Chapter 2 "Past works on port-city relationships" aims at clarifying the concept of "port city" itself in order to base international comparison on a common theoretical ground (Fig.1-2). After the conceptual review, we highlight the most recent works that have been focusing on port-city relationships' quantitative analysis. If these works remain few, they are good examples for the present research, notably in terms of criteria selection. Following empirical works, another way of comparing port cities is to look at spatial models. Those focusing on general characteristics are few and limited, then we propose two other kinds of modelling, based on a grid of structures and dynamics, and on the spatial model of the European port city.

2) Macro-regional trends for European port cities

<Figure 1-2> Organisation of the research



Chapter 3 “Quantitative approach of European port-city interface” aims at providing a clear synthesis of the major trends affecting European major port cities in the recent period. By using factor analysis on a sample of 69 port cities and 13 indicators on urban, port and logistic functions, we show four main tendencies which describe how port-city interface is functioning in Europe, in terms of concentration, opposition, specialisation and combination. A typology with four types of port-city relationships is proposed: general city, intermodal port, maritime city and gateway.

3) Local spatial structure and planning projects

Chapter 4 “Qualitative approach of European port-city interface” is based on the results provided by the quantitative approach. A sample of eight European port cities is chosen from the typology: Le Havre, Genoa (“Gateways”), Marseilles, Rotterdam, Southampton (“Intermodal ports”), Barcelona, Liverpool (“Maritime cities”) and Gdansk (“General city”), to be analysed in their regional and local context.

4) Asian logics of port-city interface organisation

Chapter 5 “Application to Asian case” applies the quantitative and qualitative methods used for the European case, with a specific focus on the Korean port cities of Incheon and Busan. In order to verify the hypothesis on Europe and Asia’s different spatial and functional organisation, a cross analysis based on common indicators is interpreted.

5) Conclusive remarks

Chapter 6 “Conclusion: policy implications” is a synthesis of the achievements of this research, to be regarded both for general cases and for the Korean one. Moreover, the chapter depicts the limits and advantages of the research.

C · H · A · P · T · E · R · 2

2 PAST WORKS ON PORT-CITY RELATIONSHIPS

This chapter points at the difficulty to define a "port city" concept, due to a specific contradiction between economic advantage and spatial constraint in port-city relationships. Selected works focus either on quantitative or qualitative aspects of these relationships.

1. The "port city" concept

1) Port city as a link between local and global

The absence of definition for the 'port city' reveals to what extent such place is difficult to analyse as a single unit (Reeves and al., 1989; Morvan, 1999). We assume that the lack of any consensual definition of the 'port city' concept comes from the complex intervening of various networks and territories in a single place, which has in turn no clear identity in itself.

The port city may be thus understood as an object giving on of the most interesting application for studying the interrelationships between global and local systems, as said cross-scale functions (Riley and al., 1988; De Roo, 1994). Many issues may be stressed such as the effect of global networks on local economies, and vice-versa (e.g. the interdependency between urban systems and shipping lines).

In this respect, the "port-city" interface definition depends on the geographical level of study; at a local scale, it is the area mixing port and urban jurisdiction and functions, the "area in transition" (Hayuth, 1982; Hoyle, 1989); at a wider scale, it is the nodal system as a whole, including multiple cities and ports within a regional area (port range, country, continent), assuming land-sea connexion.

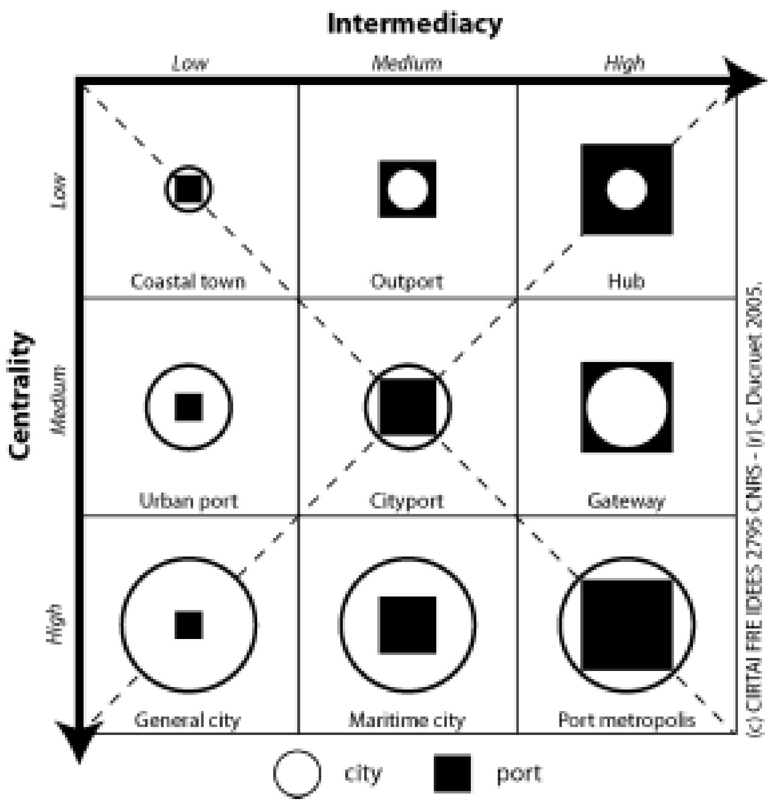
2) Spatial dysfunction: the urban environment as a constraint to port development

The evolution of maritime technology and the search for increased concentration of shipping lines have led towards excessive competition and to the search for unconstrained sites so as to build efficient terminals like 'outports' in England and France (Bird, 1963; Perpillou, 1962), and transhipment hubs remote from urban settlements. The urban environment is often seen as a spatial constraint for port expansion, and also as a secondary or 'residual' market for port activity (UNCTAD, 1985), as shipping lines and logistic companies' strategies are built on wider levels (Slack, 1993). A number of authors have thus been observing a growing separation between urban systems and port systems in various regions, whereas the latter's purpose is still to serve the first.

3) Functional combination: the port as a tool for urban economic diversification

However, on the urban side, port and maritime functions may be advantageous for the local economy in terms of land provision (wasteland redevelopment) and international trade opportunities. Some authors insisted on alternative strategies to develop obsolete port areas for new port uses (Charlier and al., 1997); in Korea for example, the recent character of port infrastructure avoids local authorities to redevelop port areas, as they are still performing original functions: this is a limiting factor in terms of lack of space. In spite of job cuts in traditional activities such as shipbuilding and repair, stevedoring, and various port services, the port function remains an advantage as it gives a long-term basis on which functions of other kinds may develop (Vigarié, 1979; Vallega, 1983; Fujita and al., 1996). We thus can consider the port and maritime functions as tools for enhancing functions which usually lack in port cities: decision-making, finance, tertiary… depending on other factors such as overall accessibility and attractivity of the node among its urban system. Next figure (Fig.2-1) gives a useful synthesis of the different combinations between urban "centrality" and port "intermediacy" (Ducruet, 2005c). Centrality may be understood as an 'endogenous' characteristic fostering trade (e.g. production activities), while intermediacy is defined by ‘exogenous’ factors such as the election of the place in the networks of transport operators (Fleming et al., 1994).

<Figure 2-1> A matrix of port-city relationships



Two diagonals are funding the different theoretical combinations and dynamics of port and urban functions. The first one (upper left – down right) shows a hierarchical trend with port-city equilibrium but with a logic of combined concentration; this trend is related to the Asian hypothesis. The second one (down left – upper right) marks an opposition – or separation – between the two aspects, with on one side the “general city” (where port function is limited) and on the other side the “hub” (where flows concentrate but without urban attractivity). From these three extreme cases (hub, port metropolis, general city), various degrees of disequilibria can be found and give birth to gateways, outports, urban ports and maritime cities.

2. Empirical works

1) A majority of case studies on waterfront redevelopment

Waterfront redevelopment has become a recurrent topic throughout academic literature since the early 1980s, following the spatial and functional shifts coming from industrial crisis and changing maritime technologies in North America and Western Europe. Most of them are monographs and few works have been looking at regular trends or 'models' underlying spatial changes at the port-city interface (Hayuth, 1982; Hoyle, 1990).

The separation between case studies (monographs) and model-based approaches has often prevented researchers from systematic comparisons that would go beyond national boundaries: Slack (1989) on Canada, O'Connor (1989) on Australia, Kidwai (1989) on India, Steck (1995) on France, Gripaios (1999) on United Kingdom and Wang and al. (2003) on China are some of the rare in-depth analysis of national port city structures. The waterfront area and planning is thus a limited part of the whole port-city planning, that also includes industrial and urban areas up to city outskirts (e.g. highway trunks).

2) Towards more international case studies

The need for understanding the repetition of same phenomena in various places have led to increasing efforts in order to bring out some kinds of rules, both from historians and geographers at a larger scale: the works on Atlantic (Knight et al., 1991; Konvitz, 1994), Asian (Basu, 1985; Murphey, 1989; Broeze et al., 1989, 1997; Ness and al., 1992; Lee, 2005) and European (Hoyle et al., 1992; Hoyle, 1996; Lawton et al. 2002) port cities are considered as belonging to similar regional areas and sharing similar trends).

3. Measurement of port-city systems

1) A minority of quantitative studies (1970s-2000s)

Only a few authors concentrated their efforts on providing comparable indicators about the port-city relationship (Wang and al., 2003). Some can be listed here, as: terminal productivity (DETR, 2003) as indicator of port efficiency and/or congestion, urban magnitude or 'centrality' (Vigarié, 1968; Kenyon, 1974) as an indicator of maritime dependence and/or overall local profile opposing production centres with relay hubs. Also Vallega (1976) proposed an index of relative concentration (%flows / %population).

Innovative research on maritime systems at a world scale, focused on shipowners' strategies and regional differentiation of flows' intensity, but with no consideration on the urban functions of the selected nodes (Marcadon, 1995; Brocard et al., 1995; Joly, 1999; Frémont et al., 2003, 2005).

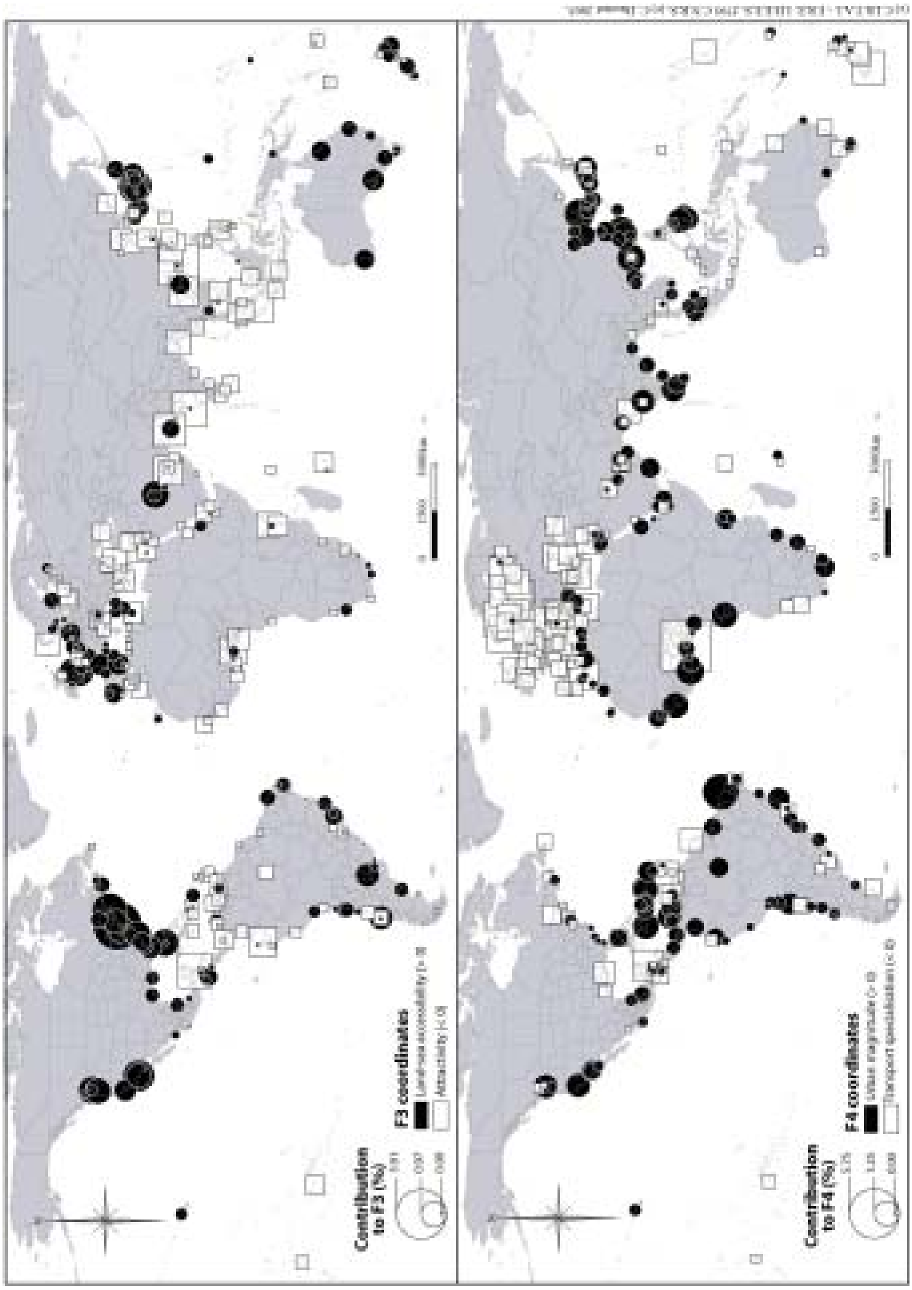
A quantitative comparison of 125 European and East Asian port nodes (Ducruet, 2003a, 2003b) has showed that maritime activities' location has a close relationship with both urban and port systems in Asia whereas only specific activities in Europe enjoy a similar distribution with either urban or port systems. This partly answers our hypothesis about specific macro-regional structures.

A global analysis of urban, port and maritime functions among 330 port cities worldwide in 1990 and 2000 (Ducruet, 2004), highlighted global structures of port-city systems, such as accessibility and attractivity, centrality and intermediacy.

In particular, Map 2-1 shows an opposition between Asia and Europe. Asian cities enjoy a correspondence between population and services but with a lack of accessibility (Japan exception), and between population and flows (urban magnitude).

European cities are characterised by land-sea accessibility and transport specialisation.

<Map 2-1> Regional influences on port-city profiles



This is another clue for our hypothesis on regional structures in both regions; if on the one hand Asian port cities are immediate coastal markets for ports, and do not enjoy well-developed hinterland transport networks, on the other hand European ones are dependent on inland markets with higher levels of accessibility and maritime specialisation.

2) The "I.R.S.I.T." research team

The Research Institute on Industrial and Territorial Strategies (Le Havre University) provided a comparison of 73 European ports (Joly et al., 2003; IRSIT, 2004), coming after two similar studies of European cities (Brunet, 1989; Rozenblat et al., 2003). The research has the particularity to highlight specific trends governing European port cities, the first study of this kind in terms of the variety of indicators.

Some achievements are the measures of accessibility, wasteland redevelopment, urban and port dynamics, unemployment, specialization…; authors particularly underline national and regional spatial structures' effects on port cities' profiles (see Tab.2-1).

3) The "Air & Sea" research team

This team from Le Havre University (Interdisciplinary Research Centre for Transport and International Affairs) is an evaluation of global players' and port authorities' discourses about air-sea intermodal potential in European port cities, inspired by case studies on Incheon (Pentaport), Hong Kong (Chep Lap Kok) and Dubai. Authors propose a measurement of transport functions in 60 European port cities (Ducruet et al., 2005a, 2005b).

A confirmation of the opposition between on one side "air & rail" (passengers), and on the other side "sea and road" (goods), means that very few European port cities can realize sea & air connections for freight handling, as the two modes seem to oppose each other, as seen in the literature on European port and transport history (Dienel, 2004).

<Table 2-1> Research issues and results of I.R.S.I.T. team

Issue	Indicator	Results
Port intermodality	15 variables of port infrastructure	- low intermodal connexion (Messina, Palermo, Catania, Tarragona, Gijon) - medium intermodal connexion (Copenhagen, Lisbon, Vigo, Bordeaux, Helsinki, Liverpool, Amsterdam, Belfast) - potential hubs (Southampton, Bremen, Le Havre, Genoa, Valencia, Marseilles, Barcelona, Dublin, Gothenburg, Oslo) - major hub ports (Rotterdam, Hamburg, Antwerpen)
Size, evolution of throughputs	Port throughput, Gibrat law	Growth rates diminish with size of throughput
Weighted throughputs and value-adding	Value-added tons	- very low (Leith, Wilhelmshaven); - low (Tarragona, Marseilles, Tees, Bordeaux, Nantes, Trieste); - medium (Rotterdam, Le Havre, Messina, Southampton, Leixoes, Amsterdam, Bilbao, Gijon, Tarento, Cagliari, Liverpool) - high (Antwerpen, Hamburg, Genoa, Barcelona) - very high (Dublin, Bremen, Helsinki, Valence, Vigo, Piraeus, Palermo,)
European radiance	Accessibility to European markets	Northern Europe > north-eastern Medit. > Scandinavia-Baltic > north-western Medit. > western periphery
Accessibility to major European cities	Accessibility from other cities	- high (Trieste, Venice) - medium (Amsterdam, Bremen, Edinburgh, Le Havre, Hull, Lubeck, Nantes, Rostock, Southampton) - low (all other cities)
Port specialisation	Nature of throughputs	- southern ports more diversified (freight + passengers) - northern ports specialised (freight OR passengers)
Industrial specialisation	Nature of ctivities	Specialisation degree diminishes with size
Urban and port functions	Combination of urban / port specialisation	- trading / diversified (Genoa, Messina, Rostock, Tallinn, Tarragona) - industrial / diversified (Aarhus, Trieste) - diversified / industrial (Bremen) - diversified / commercial (Bordeaux, Bristol, Lubeck, Helsinki, Leixoes, Rotterdam, Vigo) - trading / energy (Southampton) - industrial / energy (Bilbao, Le Havre, Nantes) - diversified / energy (Edinburgh, Liverpool, Marseilles) - tertiary / diversified (Amsterdam)
Port cities within European cities	Level of attractiveness (in general, lower for port cities while compared to non-port cities)	- high (Amsterdam) - very important (Barcelona, Lisbon, Stockholm) - important (Piraeus, Dublin, Hamburg, Helsinki, Copenhagen, Marseilles, Oslo) - medium (Antwerpen, Bilbao, Bordeaux, Edinburgh, Glasgow, Gothenburg, Nantes, Naples, Leixoes, Rotterdam, Thessaloniki, Valencia, Venice) - low (Bari, Bremen, Bristol, Cagliari, Genoa, Gijon, Liverpool, Palermo, Rouen, Southampton, Tarragona, Trieste) - very low (Belfast, Catania, Le Havre, Hull, Lubeck, Messina, Rostock, Salerno, Taranto, Vigo)

4. Spatial models of port-city interface

The existence of general models of port-city interface is useful for conducting international comparison. They will be introduced in three steps: “general spatial models”, for the port city itself, “spatial structures and dynamics”, as a grid showing different schemes from local to global scale, and the “model of the European port city”, focusing on specific European characters.

1) General spatial models of the port city

In the geographical literature, urban and port spatial models have remained separated for a long time. According to Gleave (1995), urban classical models like those of Park, Burgess, Hoyt, Harris and Ullman “*almost never take into account the influence of port activities on urban spatial structure*”. We can go back to older general approaches which tried to find common trends in port-city internal organization, more spatial than purely rent-oriented (West, 1989).

The work of Zaremba (1962) pays a particular attention to physical factors (site) to explain the waterfront evolution and structure. The location on lakes, bays, shores, through a morpho-functional approach are here determining the development of the port city.

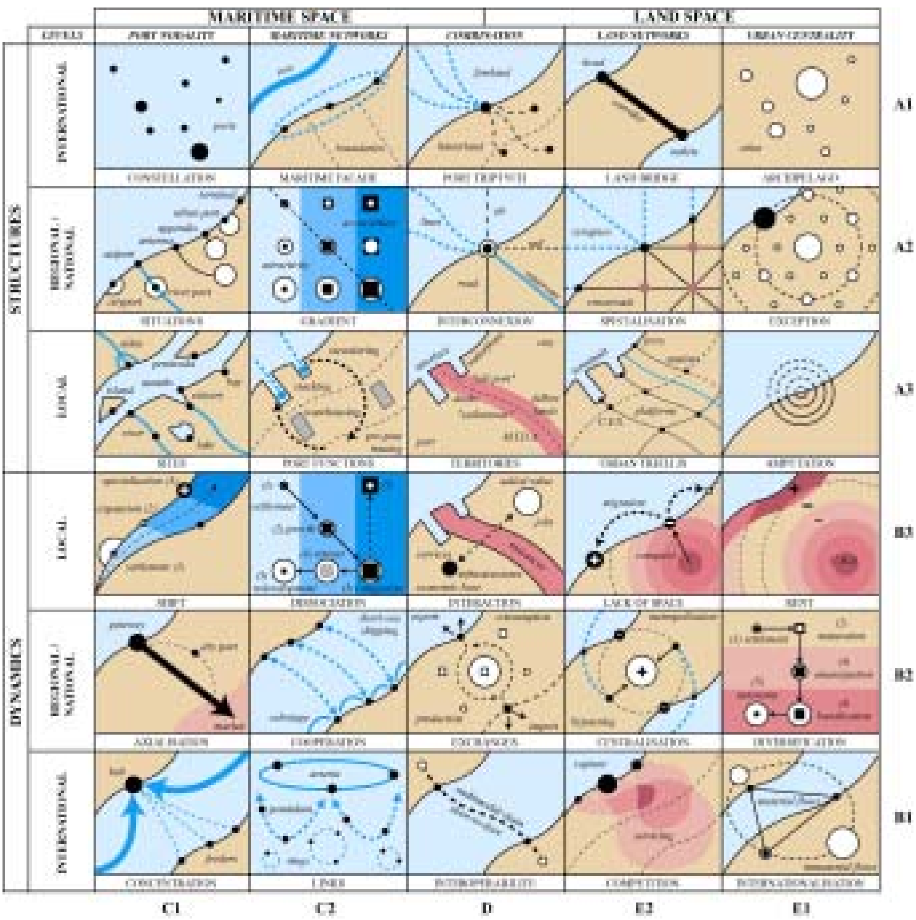
The model of Hudson (1996) is more synthetic but is also based on urban morphology, in order to express the originality of the littoral frontier’s effects on the spatial structure. The proximity of the CBD to the waterfront and the port gives specificities in terms of planning compared to other cities (inland) and other functions (airport).

The ‘magical triangle’ of Frémont (1996) and Chédot (1999) looks at the functional aspects of the port-city interface. The spatial evolution of ports are influenced locally by their belonging to an urban, hinterland and maritime interface which shape the waterfront. The emergence of coherent projects depends on the harmonious management of the three interfaces.

Other spatial models are directly influenced by an historical period and/or a regional aspect of the waterfront. Hoyle’s works on African waterfronts (e.g. Lamu in Kenya), McGee’s (1967) model of the south-East Asian city, Rodrigue’s (1994) model of the ‘Extended Metropolitan Region’ (applied to Singapore), Kosambi and al. (1988) model of the colonial port city and the recent work of Eliot (2003) on a graphical model of the south Asian port metropolis are some example of regional-based models.

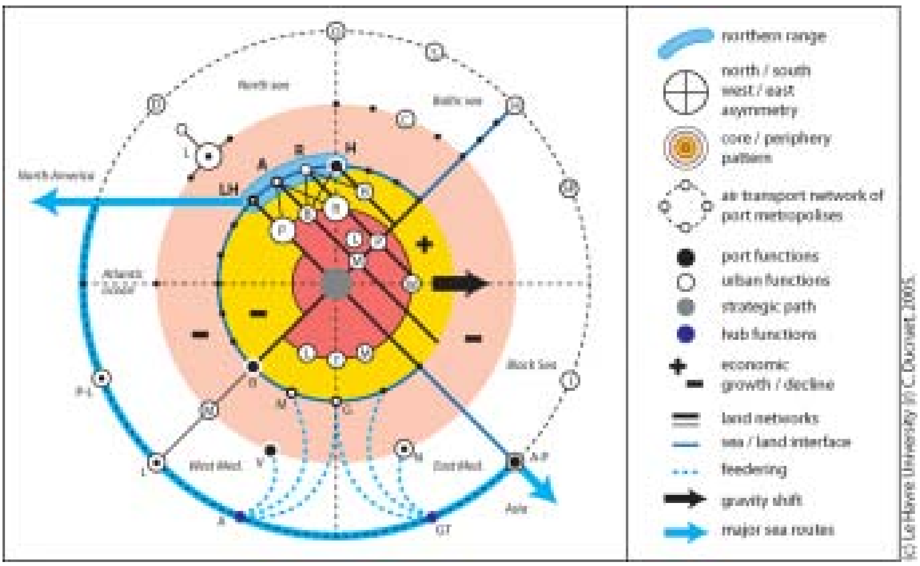
2) Spatial structures and dynamics

<Figure 2-2> Port-city spatial structures at different levels



One application of this grid is proposed in next figure (see Fig.2-3) with the northern range port system (Le Havre to Hamburg). Spatial schemes are thus used to demonstrate the particular position of the northern range within the European territory.

<Figure 2-3> A model of northern range port's situation in Europe



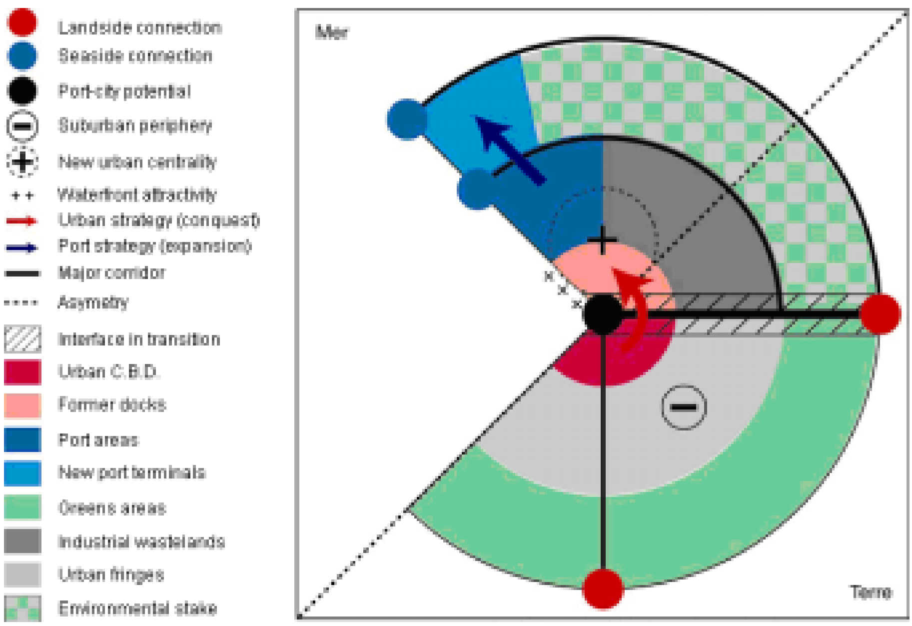
3) A spatial model of the European port city

This model (see Fig.2-4) is another synthesis, focusing on European port cities' specific patterns. Three main parts within the model can be highlighted. First, a 'transition' area marks a separation and combination between port and urban functions (interface), often corresponding to a transport corridor between sea and outer urban areas.

In the upper part, a new urban centrality and a new port area are under construction, through development projects. A double shift from the city centre to the waterfront (redevelopment of old dockyards), and from the traditional port to outer areas (new terminals) aims at limiting environmental nuisances and solving the lack of space.

In the lower part, a concentric organisation with access to ring highways and airport, and suburban extension for residential purposes, marks the development of non-port functions (e.g. research, education, tertiary services) like any other city.

<Figure 2-4> Spatial model of the European port city



C · H · A · P · T · E · R · 3

3 QUANTITATIVE APPROACH OF EUROPEAN PORT-CITY INTERFACE

This chapter proposes a macro-regional analysis of European port-city interface through the use of relevant indicators for a factor analysis. Four factors are highlighted, together with their spatial distribution. The combination of the factors provides a classification of European port cities with four different types of port-city relationships.

1. Selection of sample cities

1) Selection criteria of sample cities

The threshold of 200,000 inhabitants is chosen as it has already been seen relevant by previous works on European port cities (Brunet, 1989; Rozenblat and al., 2003). This criteria assumes that such places have enough importance in terms of market and local development potential, when compared to smaller cities or pure ‘hubs’ or ‘outports’ where the lack of urban functions does not lead to important port-city issues. Another reason for not including smaller cities is that a larger sample would have increased statistical needs beyond the objectives of this study, which is to fit with Asian and Korean urban standards.

In order to keep unity among our sample, we selected only the cities participating to containerised maritime transport, as an indicator of trade performance and sustainable port function in an urban environment. The cities of Brighton, Plymouth, Portsmouth (UK), Nice and Toulon (France), in spite of their demographic size, haven’t been selected as they do not have any container facilities and /or throughput.

<Table 3-1> The selected 69 European port cities

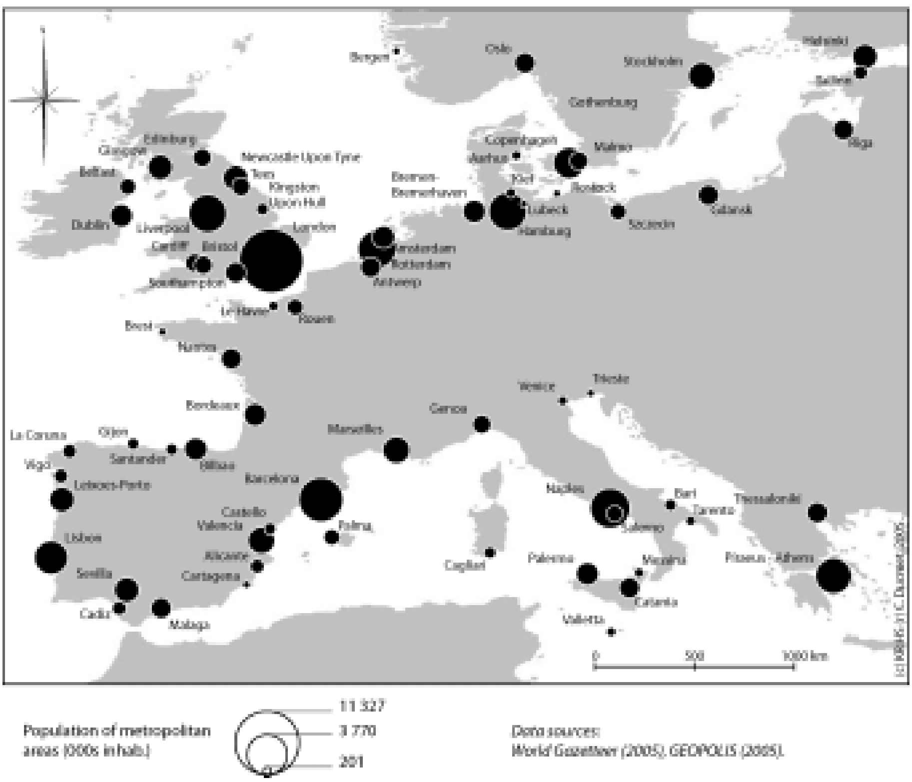
PORT CITY NAME	COUNTRY	PORT CITY NAME	COUNTRY
AARHUS	Denmark	LIVERPOOL	UK
ALICANTE	Spain	LONDON	UK
AMSTERDAM	Netherlands	LUBECK	Germany
ANTWERPEN	Belgium	MALAGA	Spain
BARCELONA	Spain	MALMO	Sweden
BARI	Italy	MARSEILLES	France
BELFAST	UK	MESSINA	Italy
BERGEN	Norway	NANTES	France
BILBAO	Spain	NAPLES	Italy
BORDEAUX	France	NEWCASTLE UPON TYNE	UK
BREMEN	Germany	OSLO	Norway
BREST	France	PALERMO	Italy
BRISTOL	UK	PALMA	Spain
CADIZ	Spain	PIRAEUS (ATHENS)	Greece
CAGLIARI	Italy	RIGA	Latvia
CARDIFF	UK	ROSTOCK	Germany
CARTAGENA	Spain	ROTTERDAM	Netherlands
CASTELLO	Spain	ROUEN	France
CATANIA	Italy	SALERNO	Italy
COPENHAGEN	Denmark	SANTANDER	Spain
DUBLIN	Ireland	SEVILLA	Spain
EDINBURGH	UK	SOUTHAMPTON	UK
GDANSK	Poland	STOCKHOLM	Sweden
GENOA	Italy	SZCZECIN	Poland
GIJON	Spain	TALLINN	Estonia
GLASGOW	UK	TARENTO	Italy
GOTENBURGH	Sweden	TARRAGONA	Spain
HAMBURG	Germany	TEES	UK
HELSINKI	Finland	THESSALONIKI	Greece
KIEL	Germany	TRIESTE	Italy
KINGSTON UPON HULL	UK	VALENCIA	Spain
LA CORUNA	Spain	VALLETTA	Malta
LE HAVRE	France	VENICE	Italy
LEIXOES (PORTO)	Portugal	VIGO	Spain
LISBON	Portugal		

Only port cities with direct access to the sea for ships have been retained, as a number of European ‘port cities’ are in fact inland or river ports (e.g. Strasbourg, Lyon, Paris, Duisburg), which are more cities than ports and whose urban structure is not comparable with seaport cities; however, some river ports closely located to the sea (within 60km) and welcoming direct calls from regular shipping lines have been kept in the sample (Rouen, Sevilla and of course Bremen, Hamburg).

2) 69 cities selected

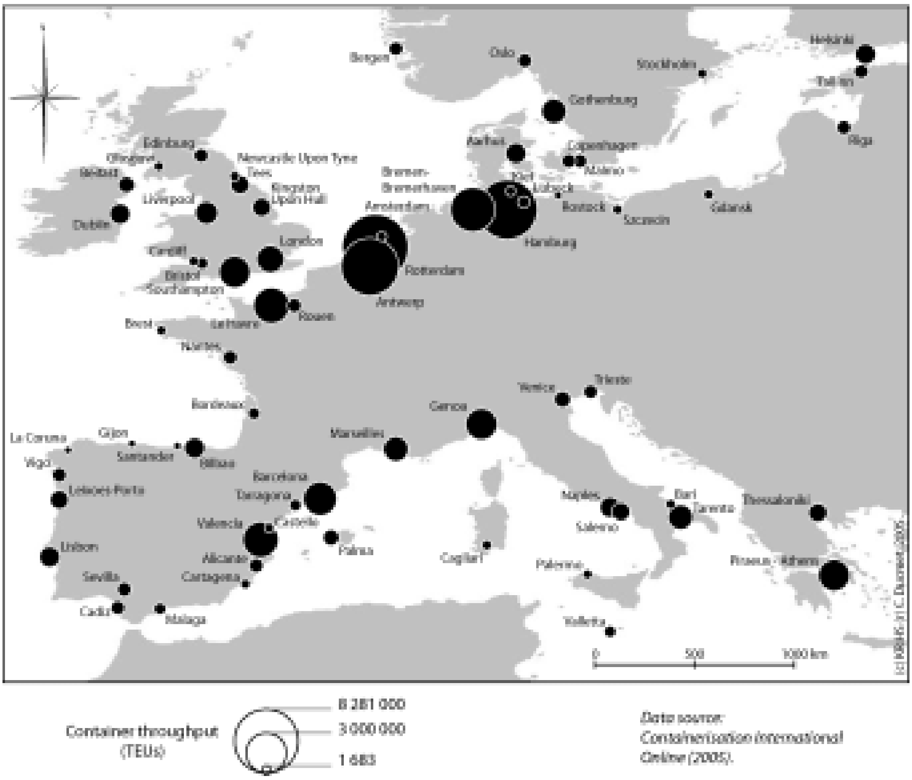
As a result of crossing these criteria, a sample of 69 European port cities has been selected for this research (Tab.3-1), representing 80.3 millions inhabitants, corresponding to 20% of the concerned countries' total population and 40% of the total population living in cities over 200,000 inhabitants (Map 3-1). It means that 1/5 inhabitant and 4/10 urban inhabitants in Europe live in major port cities.

<Map 3-1> Population of European sample cities in 2005



With a total of 47,884,473 TEUs in 2004 (Map 3-2), our sample exactly covers 15.79% of world seaborne containerized shipments (UNCTAD 2005), with a total of 3,054 direct calls from shipping lines.

<Map 3-2> Container throughput of European sample cities in 2005



2. Collection of indicators

1) Selection criteria of indicators

Three categories for selecting indicators are presented below: urban importance, port and transport infrastructures, flows and services.

- Urban importance

Population of the administrative area: the number of inhabitants in the inner city administrative division expresses the size of the local power unit where the port is located.

Population of the metropolitan area: the number of inhabitants in the whole urbanised area expresses the scale of the immediate market served by the port.

Population of the suburban area: the number of inhabitants in the suburban area gives an idea of the urbanisation level of some port cities.

Surface of the metropolitan area: the size of the perimeter covered by continuous urbanisation shows in which type of settlement does the port functions develop. This has been calculated manually (Ducruet, 2004) from online geographical atlas.

- Port and transport infrastructures

Number of highways connecting the port city: the total highway connections serving the port city gives an idea of the potential for port hinterland coverage from the terminals through road transport (trucks).

Number of railways connecting the port city: the total railway connections serving the port city is a good indicator of insertion within land systems and might reflect a potential of intermodality between sea and land for containers, although this does not prove the real connection between port and rail tracks for the handling of goods.

Total length of quays: the total amount of port quays is a rough indicator of port infrastructures including all sorts of functions (general cargo, oil, ferry, cruise, bulk, containers, multi-purpose, fishing piers…). This reflects the port's importance and overall potential for trade.

Length of container terminals: the total amount of container terminal frontage is an indicator of modernity, as containers developed since the 1970s, for the handling of manufactured goods.

Maximum depth of the container terminals: given the increase in vessel size, the maximum depth for container terminals gives the nautical accessibility level of port infrastructures in a competitive context.

- Flows and services

Container throughput: the total amount of TEUs (Twenty-Foot Equivalent Units) reflects the level of a port's activity and insertion within the transport chain. The difficulty comes from distinguishing real trade coming from the port's hinterland (sea-land) and redistribution from one ship to another (sea-sea), as this information is strategic and usually lacks.

Total number of containerised direct calls: the total amount of regular services calling at port (mother vessels) from shipping lines (service offered by shipowners) is an indicator of foreland wideness and stability for the port activity.

Number of container-related services: the total amount of such activities (shipowners, repair, distribution, inspection, clearance, warehousing…) give an idea of the level of transport functions around a port.

Number of international forwarding agents: the total amount of forwarding and logistics agents (e.g. DHL, Panalpina, Kuehne & Nagel, ABX, Damco…) show the degree of attractiveness of a place for its insertion within sea and land networks.

2) 13 indicators selected

A dataset of 13 variables (see Tab.3-2) is then available from various international databases. If the data may appear limited in order to measure port-city relationships, we assume that this is sufficient for providing a good idea of the basic characteristics of port-city relationships in Europe but also in Asia.

The sources used for building the database are of the few existing international databases providing quality numbers. For example, *Containerisation International*, is a yearly publication on the container business at a world scale, and could be used for collecting here five of our indicators (container-related activities, direct calls, length and depth of container terminals, container throughput).

<Table 3-2> Selected 13 indicators

INDICATOR	**CODE**

Number of container-related activities	CONBUS
Total number of containerised direct calls	DIRCAL
Number of international forwarding agents	FORBUS
Number of highways connecting the port city	HIGHWA
Maximum depth of the container terminals	MAXDEP
Surface of the metropolitan area	METARE
Population of the administrative area	POPADM
Population of the metropolitan area	POPMET
Population of the suburban area	POPSUB
Total length of quays	QUALEN
Number of railways connecting the port city	RAILWA
Length of container-related terminals	TERLEN
Container throughput	TEUTRA

For the population, a recent global database "World Gazetteer" distinguishes administrative and metropolitan population for every important city in the world, allowing to calculate suburban population (difference between metropolitan and administrative population). Furthermore, specialised databases like those from the "International Transport Journal", the register of freight forwarding agents, and from "Lloyd's Port of the World", for overall port infrastructures, are major publications used by most scholars in maritime and port geography and economics. Lastly, the calculation of urbanised areas' surface has been made possible by manual operation from online atlas.

3. Factor analysis of port-city interface

1) Description of main factors

The Factor Analysis of raw data shall underline the hidden statistical structure of the 13 indicators (see Tab.3-2). Before conducting analysis, we transformed original data into logarithm, so as to reduce extreme values and keep the original structure at the same time.

<Table 3-3> Four main factors (European factor analysis)

	F1 (51.34%)	**F2** (15.28%)	**F3** (6.62%)	**F4** (5.58%)

> 0	**CONBUS (10.60%)** FORBUS (10.40%) POPMET (9.91%) DIRCAL (9.68%) METARE (8.97%)	**MAXDEP (15.08%)** TERLEN (10.83%) DIRCAL (8.04%) TEUTRA (5.09%) QUALEN (3.79%)	**POPSUB (42.00%)** MAXDEP (13.65%) POPMET (5.95%) DIRCAL (1.16%) FORBUS (0.85%)	**RAILWA (37.90%)** MAXDEP (21.12%) TERLEN (9.82%) POPADM (1.71%) HIGHWA (1.41%)
< 0	-	POPSUB (6.91%) POPMET (9.91%) HIGHWA (10.17%) POPADM (11.01%) **RAILWA (11.69%)**	METARE (3.65%) CONBUS (5.38%) QUALEN (7.27%) TEUTRA (7.88%) **POPADM (9.37%)**	TEUTRA (2.35%) POPMET (2.42%) FORBUS (4.29%) POPSUB (7.05%) **CONBUS (9.09%)**

The analysis highlights three major factors accounting for more than 79% of original data (Tab.3-3), with also the contribution (%) of each indicator to each of the factors, and the most contributing indicator in bold. The explanation of the factors is presented through four ideas: port-city concentration, opposition, combination and specialisation.

- Port-city concentration (F1) is a hierarchical trend built on container-related companies (CONBUS) as the most important indicator, followed by international forwarders (FORBUS), metropolitan population (POPMET), foreland connections (DIRCALL), and the surface of the urbanised area (METARE). Forwarder agents' activity is basically defined by transfer goods from loading to unloading points (e.g. from port to market and vice-versa). The foreland of a port is the number of other ports connected through shipping lines. This highlights a hierarchy based on the concentration of both transport, urban and maritime functions. However, **the most important indicator is transport services, which lie at the interface between urban and port activities**. This also reflects the global importance of transfer functions within urban systems, as transport services locate in any city, but still mark some specific sector among port cities' economy, as an effect of port activity. This trend recalls Figure2 (matrix) with the diagonal of centrality / intermediacy concentration.

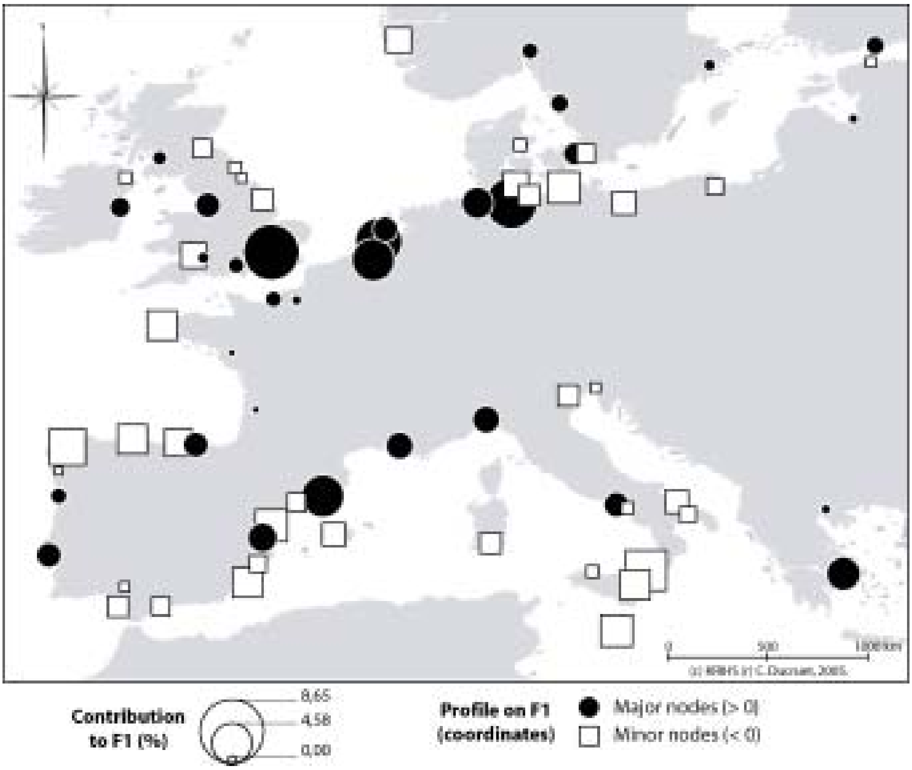
- Port-city opposition (F2) is an opposition between maximum depth (MAXDEP), container terminal length (TERLEN), foreland connections (DIRCAL), container throughput (TEUTRA), total quay length (QUALEN) and land connections (RAILWA and HIGHWA) and urban population (POPADM, POPMET and POPSUB). This is a clear **opposition between port specialisation,** notably through the capacity for welcoming biggest ships and widest connections**, and city size in terms of hinterland radiance (rail, road) and population**. Such a classical opposition also recalls Figure2 (matrix) with the diagonal of opposition between the "hub" and the "general city".

- Port-city combination (F3) is a complex factor as it opposes two trends, each of them combining urban and port / maritime indicators. On one side, urban population (POPSUB, POPMET) combine with maximum depth of terminals (MAXDEP); on the other side, another urban population (POPADM) combines with container throughput (TEUTRA) and port mass (QUALEN). It means that the different urban populations are reacting differently to other port-city indicators. We propose an interpretation in terms of **connectivity and nodality**, as some cities have a potential to welcome maritime networks through population and accessibility (connectivity), while others welcome throughput thanks to limited urbanisation and important port infrastructure (nodality) at the same time.

- Port-city specialisation (F4) is opposing different kinds of physical infrastructure (nautical accessibility and length of terminals, railways and highways), to transport activities (forwarders and container-related), and population (suburban metropolitan). Some cities have a technical potential for realizing sea-land connection for the transfer of goods, while others welcome specific transport services: **land-sea accessibility and tertiary attractivity**.

2) Spatial profile of main factors

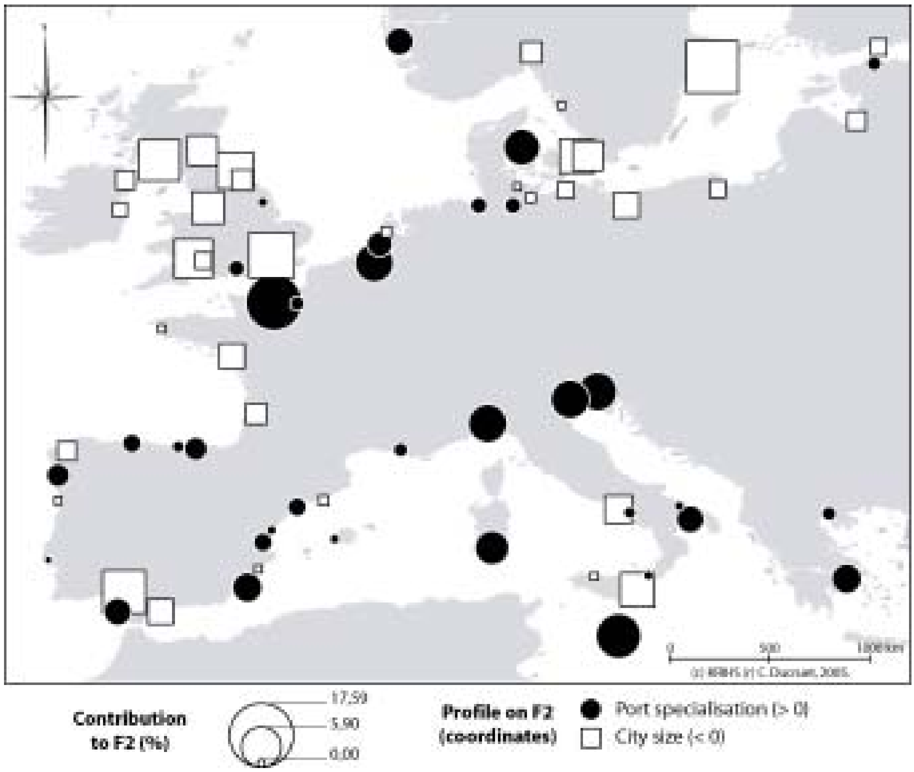
<Map 3-3> F1 profile (Europe)



So as to answer our hypothesis about the spatial organisation of Europe according to port-city interface, the following maps and interpretation illustrate the results of the factor analysis.

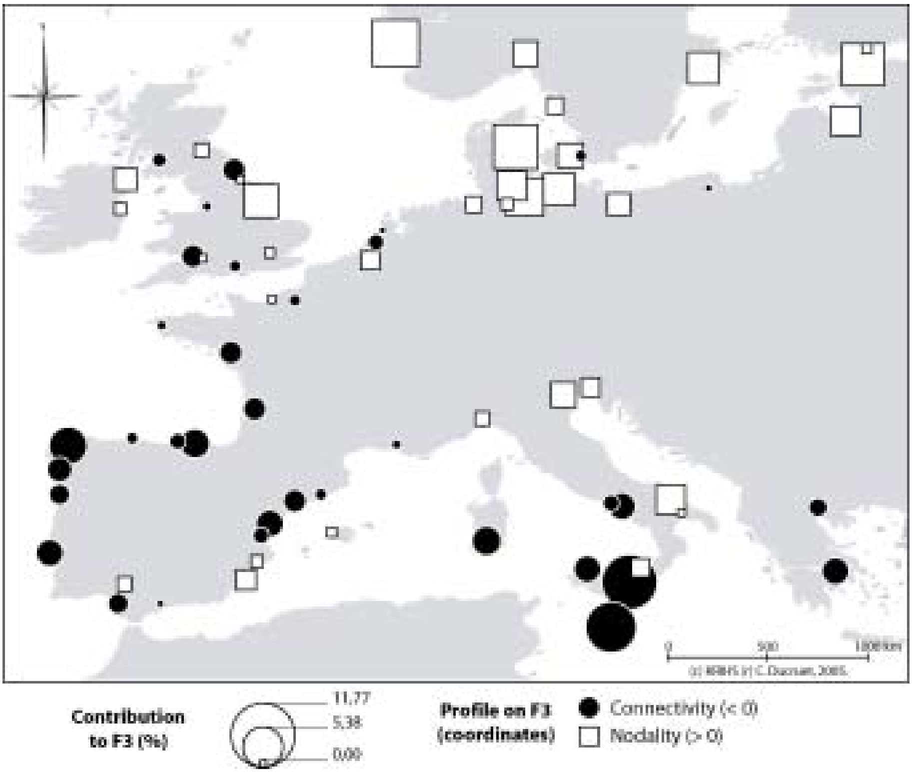
- A spatial concentration (F1) shows that ‘major nodes’ (coordinates on F1 > 0) are both important cities AND important ports: London, Hamburg, Rotterdam, Barcelona, Antwerpen, Bremen… Major nodes are mostly located close to inland markets (Le Havre – Hamburg, Barcelona – Genoa), together with some ‘peripheral’ port cities like south-eastern Piraeus (Athens), south-western Lisbon and north-western Liverpool. Minor nodes (coordinates on F1 < 0) are mostly located along Atlantic and Mediterranean Europe (e.g. Iberian peninsula, southern Italy).

<Map 3-4> F2 profile (Europe)



- Mainland concentration and north-south divide (F2) is opposing smaller cities with important levels of port specialisation (the closest to mainland markets and a majority of southern cities) to bigger “general” cities (Scandinavia-Baltic, UK). Lower scores (%) might be explained by the fact that some cities combine both city size and port specialisation: Lisbon, Hamburg, Barcelona, Amsterdam.

<Map 3-5> F3 profile (Europe)

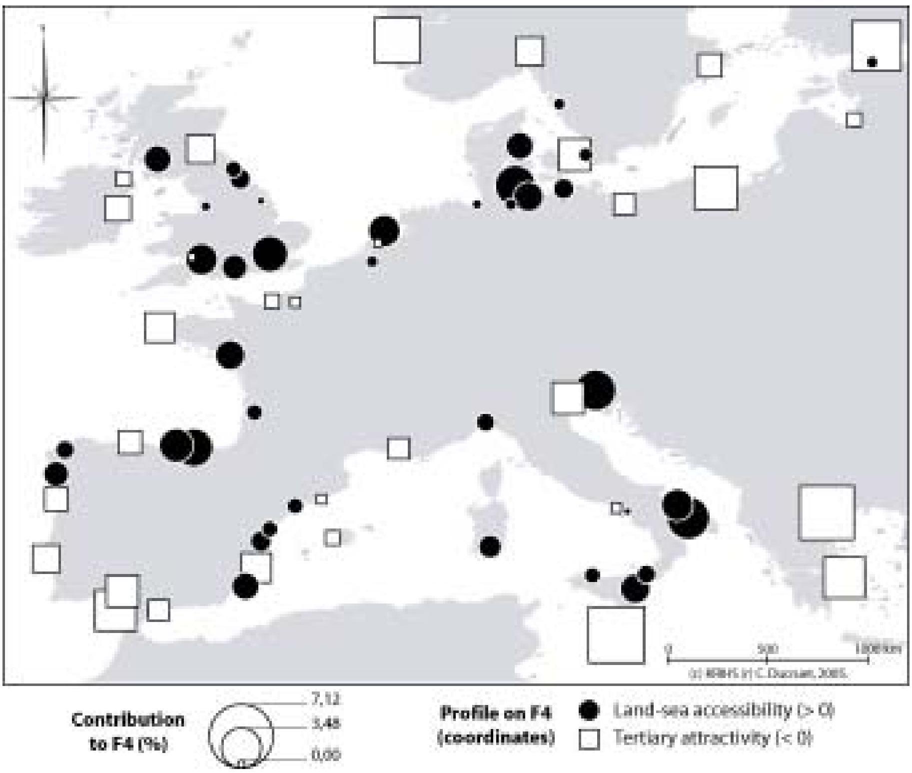


- South-west area, opposed to north-east (F3), marks a combination of urbanisation and accessibility for attracting maritime networks. The north-eastern area combines port mass and absence of high urbanisation to attract throughputs. We find here a specificity of southern cities with the consequence of their recent demographic and spatial growth, without being very important ports compared to northern ones. On the other hand, northern cities (as well as some Italian) are concentrating more volumes and infrastructures but without important local urban environments, in relative terms.

- Core-periphery pattern (F4) is not totally homogenous but a "less accessible cities" are more remotely situated than other cities. As an effect, their profile tends to be more attractive for international operators, but for other purposes than port activity itself (e.g. air transport). The other cities, locating closer to the core of the continent, have the necessity to serve such related markets by land transport.

However, the case of Le Havre is an exception, as without “real” attractivity (e.g. very low air traffic) it welcomes numerous maritime and logistic headquarters and is, at the same time, poorly connected to mainland Europe (double effect of Paris proximity).

<Map 3-6> F4 profile (Europe)



3) Port-city interface typology

As showed in the following table, the grouping of port cities according to different factors gives a clear idea of how European port cities’ interface is functioning in relative terms.

<Table 3-4> Classification of European port cities

	CITY SIZE	PORT SPECIALISATION	
CONNECTIVITY	**Amsterdam, Bordeaux, Bristol, Glasgow, Liverpool, Nantes**, Catania, La Coruna, Malmö, Newcastle upon Tyne, Palermo	**Bilbao, Southampton, Valencia**, Cagliari, Castello, Salerno, Santander, Tarragona, Vigo	LAND-SEA ACCESSIBILITY
CONNECTIVITY	**Barcelona, Leixoes, Naples**, Brest, Cardiff, Gdansk, Malaga	**Lisbon, Marseilles, Piraeus, Rotterdam, Rouen, Thessaloniki**, Cadiz, Gijon, Valletta	TERTIARY ATTRACTIVITY
NODALITY	**Gothenburg, London**, Kiel, Lubeck, Rostock, Tees	**Antwerp, Bremen, Genoa, Hamburg**, Aarhus, Bari, Cartagena, Kingston upon Hull, Messina, Tallinn, Taranto, Trieste	LAND-SEA ACCESSIBILITY
NODALITY	**Copenhagen, Dublin, Helsinki, Oslo, Riga, Stockholm**, Alicante, Belfast, Edinburgh, Sevilla, Szczecin	**Le Havre**, Bergen, Palma, Venice	TERTIARY ATTRACTIVITY

Port cities having positive coordinates on F1 have been put in bold ("major nodes"). It is interesting to compare these results to the former but recent quantitative research introduced in Chapter 2 (IRSIT, 2004). In particular, some interesting correspondence with the present results may be highlighted (see Tab.3-4). For example, Barcelona, Lisbon and Stockholm enjoy similar profiles in both research results: "attractive" cities more than "big ports", together with Piraeus, Dublin, Helsinki, Copenhagen, Marseilles and Oslo. Inversely, Le Havre, Southampton, Genoa, Liverpool, Bremen, Valencia, Nantes, Antwerp, Bordeaux, Glasgow and Gothenburg are here opposed to attractivity (accessibility), and enjoy a very low to medium attractivity in the IRSIT study, which again confirms our results. Rotterdam and

Leixoes are diversified and commercial cities for IRSIT and here are characterised by attractivity. From such comments, an in-depth interpretation is needed by referring to the matrix of port-city relationships (see Fig.2-1), so as to propose a typology. The eight groups in Table 3-5 can be classified into only four types of port cities enjoying similar interfaces in purely objective terms: general cities, maritime cities, intermodal ports and gateways.

<Table 3-5> Typology of European port cities

	MAJOR NODES (F1 > 0)	**SECONDARY NODES (F1 < 0)**
GENERAL CITIES	**Bristol, Copenhagen, Dublin, Gothenburg, Helsinki, London, Oslo, Riga, Stockholm**	Alicante, Belfast, Edinburgh, Kiel, Lubeck, Rostock, Sevilla, Szczecin, Tees
INTERMODAL PORTS	**Bilbao, Lisbon, Marseilles, Piraeus, Rotterdam, Rouen, Southampton, Valencia, Thessaloniki**	Cadiz, Cagliari, Castello, Gijon, Salerno, Santander, Tarragona, Valletta, Vigo
MARITIME CITIES	**Amsterdam, Barcelona, Bordeaux, Glasgow, Leixoes, Liverpool, Nantes, Naples**	Brest,Catania, La Coruna, Malmö, Newcastle upon Tyne, Palermo, Cardiff, Gdansk, Malaga
GATEWAYS	**Antwerp, Bremen, Genoa, Hamburg, Le Havre**	Aarhus, Bari, Bergen, Cartagena, Kingston upon Hull, Messina, Palma, Tallinn, Taranto, Trieste, Venice

- General cities: can be defined as port cities with a low port function compared to the rest of the local economy, which is diversified and not anymore dependent on maritime trade for its own development (e.g. Bristol, London, Gothenburg and the major northern capitals). This profile is well illustrated by Figure 2-1 (matrix), as an evolutionary step of port-city separation, well described by Murphey (1989) in its evolutionary model of the port city.

- Maritime cities: can de fined as important urban settlements which keep important connections to maritime trade, but whose port function is reduced compared to the rest of the economy (e.g. Amsterdam, Barcelona, Naples and most Atlantic cities).

- Intermodal ports: can be defined as ports specialised in connecting transport networks with efficiency (e.g. Lisbon, Piraeus, Marseilles), either land-sea and sea-sea networks. This profile means a concentration of flows in a diversified and urbanised environment.

- Gateways: can be defined as specialised cities with efficient port functions, where the local economy doesn’t play an important role for international trade and remains very dependent on the port activity (e.g. Antwerp, Genoa, Le Havre). This profile is also illustrated by Figure 2-1 (matrix), as an opposed profile to “general city”.

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4

QUALITATIVE APPROACH OF EUROPEAN PORT-CITY INTERFACE

This chapter applies graphical modelling to a sample of eight European port cities selected from the previous analysis. Some deviation to a European model and the interpretation of current redevelopment strategies are illustrated as a complement to quantitative results.

1. Qualitative approach to the 8 selected port cities

A qualitative approach is absolutely necessary to bring a complement to quantitative results from the factor analysis, for several reasons. First of all, the factor analysis, if it brings useful insights on macro-regional patterns and resemblance between port cities, cannot include very detailed aspects of each particular case. Secondly, there is a need to verify to what extent local specificities, in terms of internal spatial organisation and planning policies, match with the typology given in Chapter 3. This approach uses graphical tools so as to synthesise a lot of information and to make the cities comparable through common representation.

1) Criteria of selection

Eight cities have been chosen from the typology given in Chapter 3. An important criteria is that all selected cities are “major nodes” on F1 main factor (coordinates > 0), with the exception of Gdansk. All of the four types are represented (see Tab.4-1), with Marseilles, Rotterdam and Southampton as “intermodal ports”, Le Havre and Genoa as “gateways”, Barcelona and Liverpool as “maritime cities” and Gdansk as “general city”.

Other criteria also intervene in the choice of cities: administrative function, distance to State capital and type of national urban network.

Such criteria are chosen in comparison with the Korean case, which is defined by a spatially centralised country.

<Table 4-1> Selected European port cities for qualitative analysis

Type	**Port cities**
General city	Gdansk
Maritime city	Barcelona, Liverpool
Intermodal port	Marseilles, Rotterdam, Southampton
Gateway	Genoa, Le Havre

- administrative function: selected cities are not State capital cities, so as to fit with the Korean case, where major port cities are metropolitan cities but none of them is the capital city.

- distance to the State capital: important factor for urban development and diversification, especially in Europe.

- type of national urban network: especially cities located within spatially centralised urban networks have been chosen (United Kingdom, France, Spain, Italy) and where the dominant city is not necessarily a port (Paris, Madrid).

2) Basic characteristics of the 8 port cities

- Gateways: Le Havre and Genoa

Le Havre, first French port for containers and value of shipped goods, has enjoyed a high port-city growth since 1954, following the reconstruction after bombings (1944) and through industrial and port expansion. Its Maritime and Industrial Development Area (MIDA) along the Seine estuary has welcomed mainly big companies (automobile, petrochemicals) and is now developing as a logistics node for north-south transport instead of being only an east-west axis to and from Paris capital region (Triade, 1993). Le Havre still suffers from a low middle class and demographic stagnation, with a weak service sector apart from transport activities.

<Map 4-1> Local maps of Le Havre and Genoa

Genoa, like other major Italian ports, is an historic port, that raises particular issues for spatial port-city planning (Affinite, 2002), in terms of urban settlement density in the “Molo” area for example, in the port area itself (Vincenzi, 2002). Genoa has for a long time suffered from “ambiguous relationships” between the city and the port (Gazzola and al., 1992). A physical separation since the 16th century has been followed by quantitative growth of port volumes, until the competition arisen from neighbouring ports in the 19th century (Leghorn, La Spezia), smaller but more efficient. Its population stagnation and decline, like for Le Havre case, is accentuated by the decline of the port’s local importance in the genoese economy (Malara, 1992), due to the emergence of service sector clusters on the edge of the agglomeration, even though port-related employment remains high in the city proper.

- Intermodal ports: Marseilles, Rotterdam, Southampton

Marseilles' history is marked by the shift from a colonial city to a regional metropolis, specialised in north-south relationships between France, northern Europe and African Mediterranean countries. The end of French colonial rule in the 1960s and the oil crisis in the 1970s put some threat on the city's prosperity, and after a period of demographic growth since the 1950s, the population started to decline from hard economic conjuncture, as well as industrial employment (57% jobs lost between 1960 and 1990). In spatial terms, it also means a redistribution of economic activities around Fos and the Berre pond, new industrial and port location. As a result, the port of Marseilles itself represents in 1992 only 7% of the Marseilles-Fos throughput (Donzel, 1992). Current planning operations (Euroméditerranée) are thus seeking to comfort the inner port activity and balance the city structure at the same time, by attracting service, leisure and commercial activities near old port areas. This constitutes a complement to previous shifts outside the city proper (airport, new port, industrial sites), so as the port becomes an advantage more than a constraint to the urban economy (Borruey, 1992).

Rotterdam as a seaport has quite a short history, shifting from "*a small ordinary city to the largest transport centre of Europe*" (Kreukels, 1992). Following the industrial revolution in 19th century Europe, Rotterdam could benefit from the proximity of Germany production centres and the foreign investments from German industrial major companies to use it as the gateway to the world (Kreukels, 1996). From this time, Rotterdam never ceased to increase its capacity and its inland connections, covering a large portion of European continent through barge (Nieuwe Waterweg), rail and road, and reaching even far-eastern locations such as China and Siberia.

<Map 4-2> Local maps of Marseilles, Rotterdam and Southampton

Together with Amsterdam and the Randstadt, Rotterdam region forms the "*most efficient distribution and international trade complex of Western Europe*" (Harding, 1992).

Another important factor influencing Rotterdam's success is the coalition of "Harbour Barons", both urban and port local elite. It became the largest port in the world during the 1960s, when oil products were starting to become an important of its trade, before the container revolution of the 1970s. At the moment, a strip of 40km between the centre of Rotterdam and the sea is occupied by harbour and industrial sites (Van Asch and al., 2004). Nowadays, following the ROM-Rijmond project (1992-1993), and the Port Plan 2010, the Maasvlakte 2 project is seen as a solution to give back to the city lots of abandoned and derelict hectares of land, as a "race for space" (De Bruijn, 1999; De Bruijn and al., 2002). On the other side, Kop Van Zuid project aims at reconnecting northern and southern parts of the city through redevelopment across water and river areas.

Southampton has suffered in the 1960-1970s from the hard cuts in employment from its traditional economic sectors such as heavy industry, shipbuilding and port stevedoring. Its location in "attractive" southern England, close to London area, allows to enhance commercial and financial activities through a dynamic municipal policy (Triade, 1993). This diversification and the betterment of regional transport infrastructures (highways and railways) gave Southampton its pivotal role as the central southern platform for freight, despite the competition arising from the Channel Tunnel (1994) and the eastern ports around the Thames. Factor analysis is then also confirming here the local importance of transport connections (intermodality) compared to other port cities.

- Maritime cities: Barcelona and Liverpool

Barcelona was defined as a "northern city located in the south" (Garcia, 1992), given its economic dynamism and fast industrialisation throughout its history. Even with a majority of SMEs, foreign investment since the 18th century has been always intense and Barcelona often surpassed Madrid's economic prosperity. A rapid demographic growth until the 1970s faced stagnation and population migrated to peripheral junctions within suburban areas, accentuating the disrupt between centre and periphery. If the port has “a lower importance than for other port cities” (Sagarra Y Trias, 1992), this is also explained by Barcelona’s economic diversity which is an advantage while facing uneven international conditions.

<Map 4-3> Local maps of Barcelona and Liverpool

Our factor analysis confirmed this situation by putting Barcelona in the type of “maritimes cities” (*important urban settlements which keep important connections to maritime trade, but whose port function is reduced compared to the rest of the economy*). In spatial terms, the degradation of inner centre, that also suffers from high population density, and the poverty of linkages with the periphery are putting some threat on the port's efficient integration within the city. A debate is in progress on the future development of the "old port" and on the integration of marine resort and maritime-related industries.

The case of Liverpool is, in spite of obvious historical divergence with Barcelona, closely related to the one of Barcelona according to our "maritime city" definition. After a high port-city growth brought by colonial trade (18^{th}) and industrialisation (19^{th}), Liverpool has accumulated a numerous but low-skilled workforce related to port activities, a weakness while the port city faced the international crisis of the 1930s (Parkinson, 1992). A loss of almost 400,000 inhabitants (1940-1980) and of 50% of national traffic couldn't be avoided by central government's industrial support to the region (automobile). A high specialisation in port and industry has avoided any development of service activities apart from the public sector. The weight and increase of unemployment is one of the most disastrous facts concerning Liverpool, reflecting its weaknesses compared to national and European trends (over-specialisation and remoteness). Local elites, in spite of dramatic political instability, have launched the "Merseyside Development Corporation" (MDC) in 1981 so as to voluntarily develop additional activities and modify the city's structure and landscape. It is however certain that the port "might no longer be the engine of the local economy (…) given the gravity shift towards Eastern Europe" (Parkinson, op. cit.) and the effects of containerisation on older port infrastructures (Evans, 1992). Recent prospects have showed that new residential, commercial and leisure activities are taking place due to the redevelopment of such obsolete areas like Albert Dock (IACP, 2004).

- General city: Gdansk

Mentioned for the first time in the eve of 11^{th} century, Gdansk belongs to Hansa towns and progressively develops its ports through successive steps: a new port in the 18^{th} century, from the inner area, the deepwater bulk port in the 1970s, following the reconstruction after World War II. The Pomeranian region generates 5% of Poland's GDP and Gdansk itself generates 75% of the region's production (Grzegorkiewicz, 2000).

<Map 4-4> Local map of Gdansk

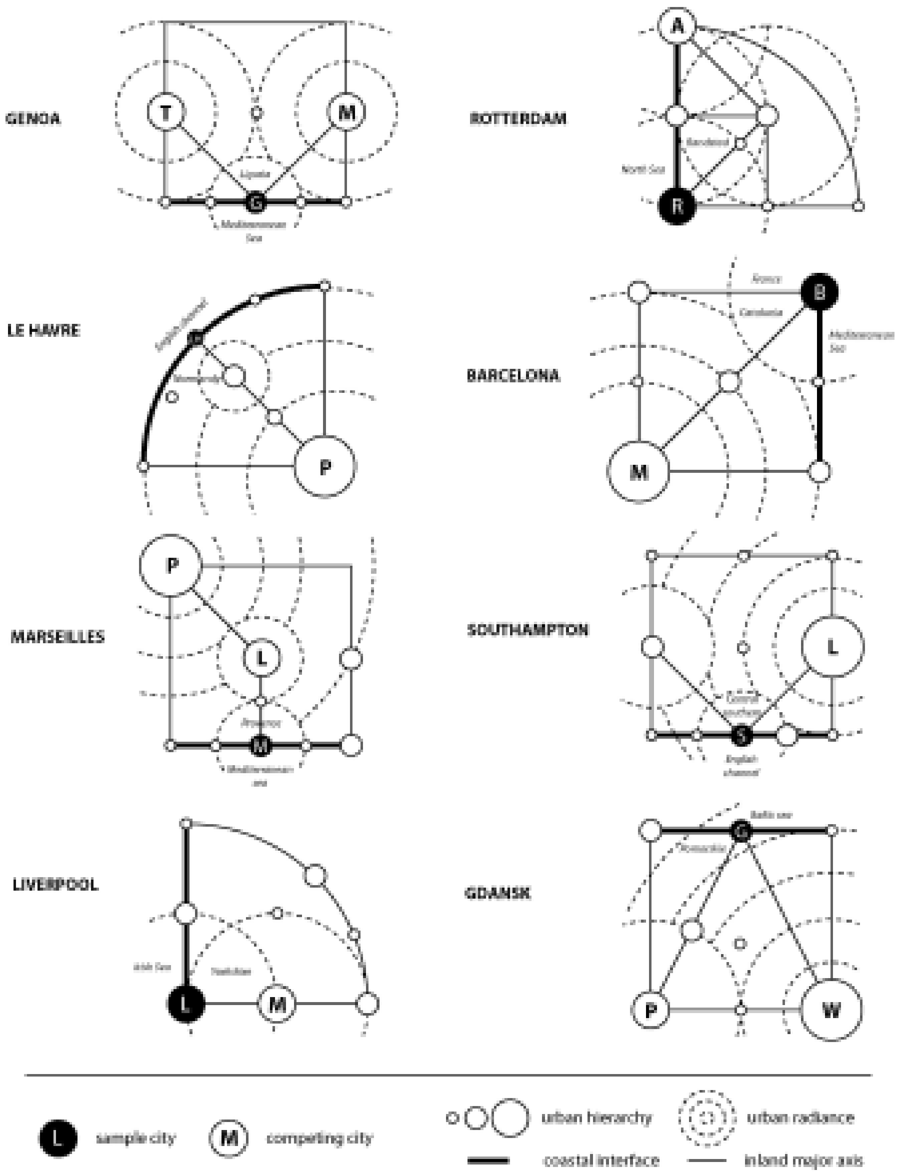
2. Spatial patterns at the regional level

The regional level is understood as a sub-continental or sub-national area where urban or port structures appear to have their own spatial logic, and therefore are possible to illustrate through graphical schemes. As a partial application of spatial models introduced in Chapter 2, this research step shows the various levels of **external pressures from inland and maritime networks**, in terms of urban and port competition.

1) Port cities' position in regional urban structure

The eight selected port cities belong to different types of urban structures, that we can compare according to a degree of 'dependency' of the port upon neighbouring inland cities. By looking at the size of cities and the distance between them, as well as the direction of influence of the major centres, we can have an idea of the relative position in the urban structure. Moreover, this allows to highlight indirectly the local importance of port activities for the city.

<Figure 4-1> Regional urban structure of European port cities



Competing cities:
Genoa: Turin and Milan ; Rotterdam: Amsterdam, The Hague and Utrecht; Le Havre: Rouen and Paris; Barcelona: Madrid, Valencia, Zaragoza and Bilbao; Marseilles: Lyon and Paris; Southampton: Bristol and London; Liverpool: Manchester; Gdansk: Warsaw and Poznan.

First of all, one recurrent position showed in Figure4-5 is a high dependence degree of the port city on neighbouring competing cities: Le Havre and Genoa (gateways) for example are subdued to the respective influence of Paris and Rouen, Turin and Milan.

A lower degree of dependence affects Marseilles, Rotterdam and Southampton (intermodal ports), as competing cities are more remote (e.g. Paris and Lyon for Marseilles) and of similar size (e.g. Randstad for Rotterdam). This implies a stronger endogenous generation power of the local economy, which is not only dominated by remote markets. The case of Southampton, if it resembles to the case of Le Havre with London and Bristol proximity (i.e. Paris and Rouen), enjoys more 'centrality' with a central position in the regional transport system and in the central southern urban network with Portsmouth and Bournemouth-Poole, in which Southampton has a leading role with intermodal connections and commercial, financial activities (sunbelt).

Barcelona and Liverpool (maritime cities) have in common to support a strong industrial region, even though recent changes did not bring the same results locally. The remoteness of the capital city (Madrid, London) ensures a higher centrality for the city, and a regional hinterland for the port (Yorkshire, Catalonia).

Lastly, the case of Gdansk (general city) shows a remoteness of inland cities but an absence of rival city in the immediate environment. The fact that port functions had been concentrating in the near Gdynia city, smaller than Gdansk, gives to the latter a profile of general city as defined in Chapter 3.

2) Port cities' position in regional port structure

Port regional structure is more difficult to study, as the flows and maritime services between ports are likely to change more quickly than inland transportation network between cities. We have chosen to fix the limits of port ranges according to usual belonging of each port in the literature on port geography: a portion of coastal area where ports are linked through common and regular shipping services. One variable is used, the 'market share', that illustrates the percentage of container throughput of each port within the regional structure. It can be used as an indicator of concentration and competition between ports. Next table (Tab.4-2) gives the numbers for the selected port cities, and next figure is an illustration of the distribution of market shares within each regional port structure.

<Table 4-2> Container market shares of selected European cities

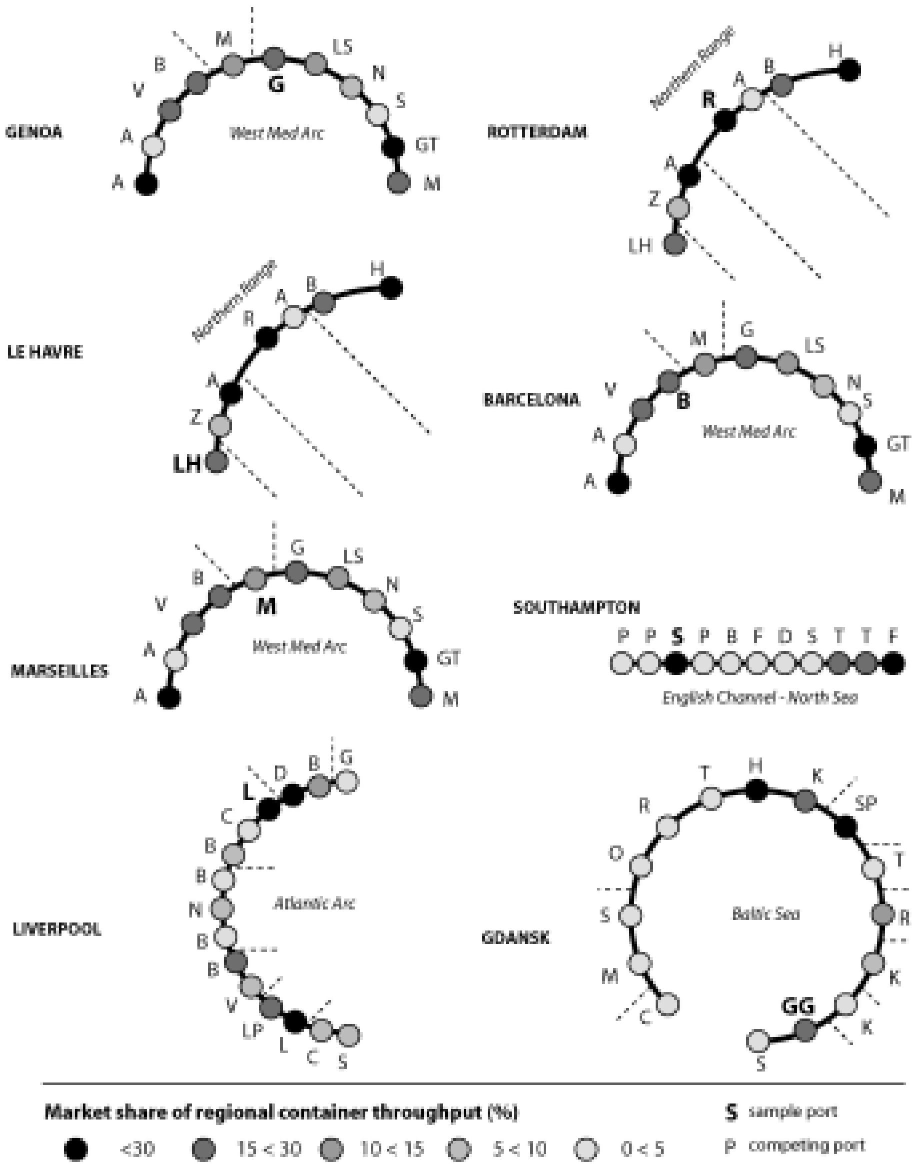
Type	Port city	Regional port structure	Container market share (%)
Gateways	Le Havre	Northern range	7.6
	Genoa	West Med. Arc	16.2
Intermodal ports	Marseilles	West Med. Arc	9.1
	Rotterdam	Northern range	29.4
	Southampton	English channel	27.0
Maritime cities	Barcelona	West Med. Arc	18.7
	Liverpool	Atlantic Arc	16.7
General city	Gdansk	Baltic Sea	1.1

- West Med arc: there is a strong **competition from hub ports** (Algeciras 19,7%, Marsaxlokk 7,9% and Gioia Tauro 16,5%) but still Barcelona (12,0%) and Genoa (10,3%) as well as Valencia (13,6%) are enjoying a better position than Marseilles (5,8%), favoured by closer and **more dynamic industrial regional economies**. Even “Fos” in Marseilles is just an efficient terminal serving distant regions for oil and containers. Other port cities have minor port functions and usually do not exceed 3% of the arc’s container throughput.

- North-western range: with Rotterdam (29,4%) in a **central position**, Le Havre (7,6%) finds hard to compete with ports that are **better connected to the European core** in terms of land connections, such as Antwerpen (21,6%), Bremen (12,3%) and Hamburg (24,9%), and there are only minor competitors between Le Havre and Antwerp (Dunkirk 0,5% and Zeebrugge 3,4%).

- Atlantic arc: in spite of its remoteness, Liverpool (16,5%) has a **dominant position** together with Dublin (15,7%), while other important market shares locate southern with Lisbon (14,9%), Bilbao (13,6%) and Leixoes-Porto (9,6%). Here again we see the importance for port cities to locate within dynamic industrial regions (Yorkshire for Liverpool with Manchester).

<Figure 1-2> Regional port structures of European port cities



Other port cities are peripheral according to both urban and port systems (France, south-western England, north and south-western Spain).
- English Channel – North Sea passage: this southern British range welcomes major British ports which **concentrate in the vicinity of Greater London**. The outports of Felixstowe (52,6%), Tilbury (9%) and Thamesport (9,4%) are thus giving a threat to Southampton which still ranks high (27%) but whose new port project 'Dibden Bay' had been rejected recently for environmental purposes. Other port cities are coastal non-port towns or mostly ferry passengers port such as Dover (0,4%), close to the Channel tunnel.

3) Relative position within urban and port structure

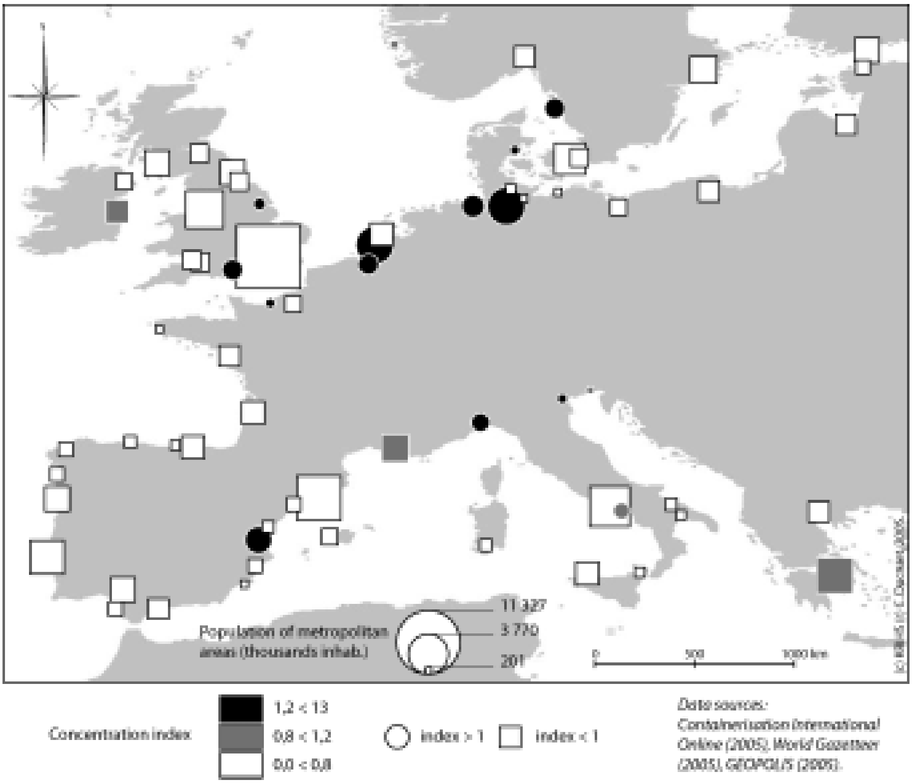
After looking separately at the selected cities' position in regional urban and port structures, we propose to use the "relative concentration index" of Vallega (1976), described in Chapter 2.

This index indicates how much a port city concentrates either population and throughput, and allows to have an idea of its relative position between the two structures of ports and cities.

According to our selected cities and to Map 4-5, we see that for example Genoa and Le Havre (gateways) have a maximal concentration index together with a small urban size. Southampton and Rotterdam (intermodal ports) have the same profile, with Marseilles enjoying more centrality and less throughput concentration. Barcelona and Liverpool (maritime cities), in spite of their important position in regional port structure, are much more central places than efficient ports in this respect, together with Gdansk (general city).

We also can underline that throughout the map, few ports concentrate a maximum volume of throughput, while a majority of ports have a low market share, and only 6 cities over 69 have an equilibrate position (Marseilles, Dublin, Piraeus, Bergen, Salerno and Trieste).

<Map 4-5> Relative urban-port concentration index



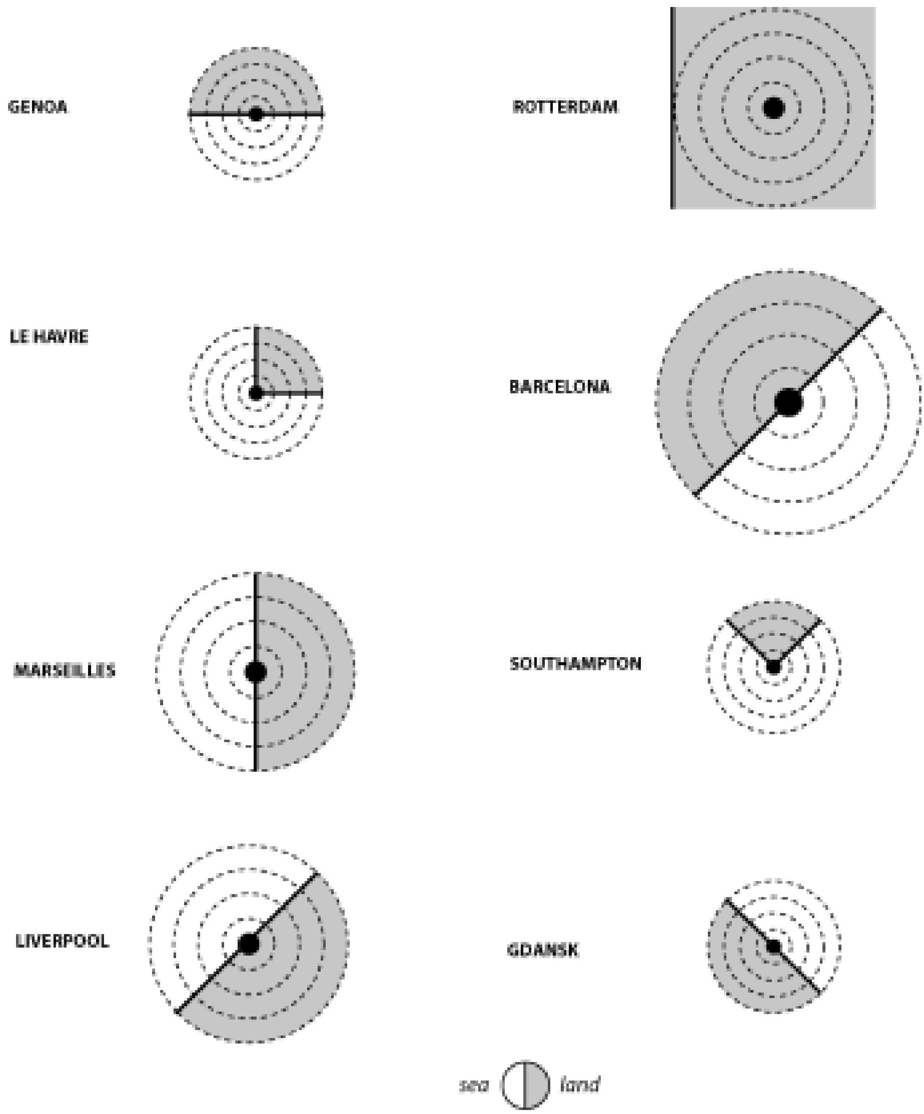
3. Spatial patterns at the local level

1) Local urban morphology

Next figure illustrates the fact that selected port cities, as expected, fit in the European spatial model of a 'semi-radial' pattern for the urbanised area ('half-circle' shape). The size of the rings correspond to the average relative size of the urbanised areas for making them more comparable.

If the half-circle works for Genoa, Barcelona, Marseilles, Liverpool and Gdansk, other cities like Le Havre and Southampton, because of limited space for urban development have developed as 'quarter-circle', due to the coastal and river constraint.

<Figure 1-3> Local urban morphology (Europe)



Finally, only Rotterdam has developed like any 'normal' city or central place, i.e. without any particular constraint, apart from the river itself which separates northern and southern parts of the city. Its location is 40 kilometres upstream the Maas river. It is common knowledge that upstream port cities of the northern range are the most important nodes for serving European markets (Antwerpen, Rotterdam, Hamburg).

However, Tab.4-3 brings a complement in a sense that the morphology of the urban settlement in only one factor among others to measure the territorial issue of port-city interface. There seems not to have any direct relation, for example, between shape and density (calculated for the whole urbanised area).

<Table 4-3> Characteristics of local urban settlements

Type	Selected port city	Urban morphology	Population density (inhab. / sq.km)
Gateways	Le Havre	Quarter circle	10,500
	Genoa	Half circle	29,384
Intermodal ports	Marseilles	Half circle	9,055
	Rotterdam	Full circle	28,227
	Southampton	Quarter circle	12,437
Maritime cities	Barcelona	Half circle	35,270
	Liverpool	Half circle	7,534
General city	Gdansk	Half circle	14,547

The reason why quarter circles are not more densely populated than half circles comes from the north-south variation of urbanism (Barcelona and Genoa), the recent gap between urbanism and real occupation of the place (e.g. losses of population in Marseilles), and the insertion of the agglomeration in dense and wider urban regions (e.g. Rotterdam within the Randstad). It shows that it is very difficult to compare local patterns in terms of territorial pressure for port activities. Such concern is in turn much more important to explain the pattern of transport infrastructures' connection.

2) Local interconnection of transport infrastructures

Obviously, a simple look at the shape of a network cannot replace the detailed study of its efficiency in terms of circulation and transfer of goods. However, the way how networks are combining within the whole local area can bring some answers on how do very different port-city interfaces function.

Schematically, we propose here three spatial patterns can be highlighted through the use of graphical schemes, so as to evaluate the selected port cities' local interconnection for transport infrastructures: separation, concentration and equilibrium.

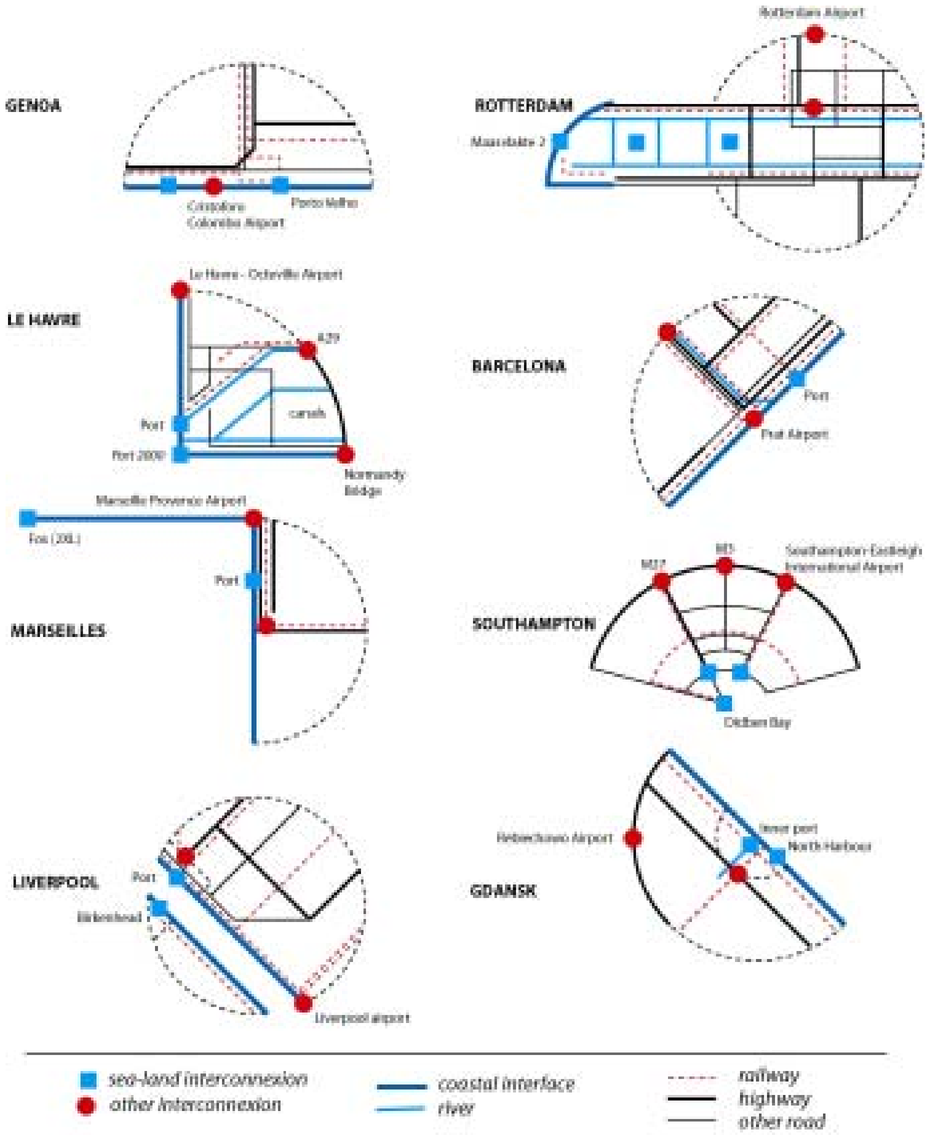
- A transportation axis divides the urban structure in two parts:

The urban structure appears to be fragmented in two halves, in terms of transport infrastructures. A higher density in one half of the urban area corresponds usually to the necessity for the city to be connected to regional and international corridors. For example, Genoa and northern Italy are turned towards France and Switzerland, Barcelona and Catalunia towards France, Marseilles and Provence towards Lyon, Paris and the Italy-Rhone axis. This international corridor combines with the major national one leading to main urban centres (e.g. Turin, Milan; Madrid).

- A transportation axis dominates the urban structure at its periphery:

As defined in the precedent chapter, 'gateways' are very specialised port cities and efficient ports; this has a direct effect on the inner structure of connections, as a major corridor is linking the port to its hinterland, passing through urban areas that are subdued to this logic. In this respect, Rotterdam shows a strong combination of rail, road and the Mass river towards European core regions, while Le Havre combines the Seine river, rail and road towards Paris, even with lower relative importance of barge transport between these two ports.

<Figure 1-4> Local interconnexion of transport modes (Europe)



- Transportation network is spatially homogenous:

Liverpool, Southampton and Gdansk do not show such ‘hierarchical’ models as their pattern is more homogenous. The island effect on Southampton (absence of international corridors) and its central position within southern England between Bristol and London give the city this impression of homogeneity. For Gdansk, the lack of dense infrastructure and its location in the northern middle of Poland, between Warsaw and Poznan, have the same effect. Finally, Liverpool is a particular case as it combines the characteristics of ‘divided’ port cities within a very dense conurbation with Manchester.

3) Urban and port development projects

As this research focuses more on the methods for comparison than on the detailed provision of information about each individual port city, we provide in Tab.4-4 and Fig.4-5 a basic overview of the projects involved. In particular in the figure, two phases are highlighted: the original state of the port-city relationship, identified as a “rupture” (1), and the resulting state of the port-city relationship, identified as “interface” (2). The first state is characterised by physical constraints to port-city junctions, in terms of public access to the waterfront, integration of old port areas within public transportation systems, but also their commercial and cultural attractivity.

The second state, depending on the goal and success of the development projects, shall integrate port and city thanks to the realization of a real “interface” for such purposes.

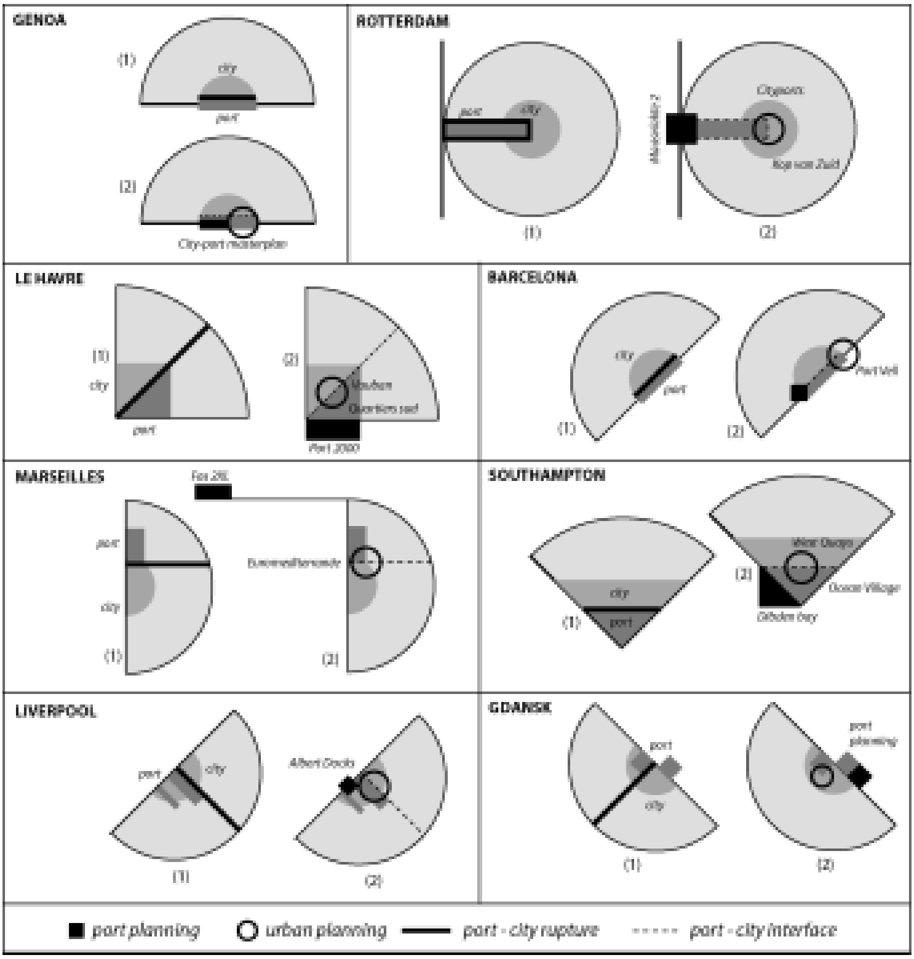
The main idea developed here as a conclusion to the qualitative approach, is that European port-city development projects are mostly focused on the integration of the urban-port interface. Their principal goal is to reconnect port and urban areas and overcome the spatial and economic barriers that have been affecting inner cities, so as to provide more space for urban functions (commercial, housing, offices, leisure), open the waterfront to public access, relieve the city from internal disequilibria in terms of social welfare, population density, transport congestion, uneven urbanism.

<Table 4-4> Selected European port cities' development projects

	PORT	URBAN	OTHER
ROTTERDAM	Maasvlakte 2	Kop van Zuid Cityports	
GENOA	Master Plan	City and Port Master Plan	
BARCELONA	Plan Delta	Port Vell	Z.A.L.
MARSEILLES	Fos 2XL	Euromediterranée	Z.A.P.
LE HAVRE	Port 2000	Quartiers Sud Vauban Gare	Normandy Bridge Logistic park
LIVERPOOL	New terminal (Royal Seaforth Dock)	Albert Dock Fourth Grace & Kings Dock South Docks Stanley Dock	Canal link
SOUTHAMPTON	Didben Bay (rejected)	Ocean Village Town Quay West Quays	
GDANSK	Liquid chemical terminal Deep sea container terminal Pomeranian logistics center	Cruise terminal Grodzisko French fortification	Martwa Wisla river bridge Inner port tunnel

Cases explored in this research are fitting with the European spatial model in a sense that most "urban planning" projects are focusing on the port-city interface reconnection. It means that the goal is to give to the city a new centrality, offered by old port areas' potential, while other cities (i.e. non-port cities) will try to expand outwards. This is a particular feature of our selected cities. For example, Le Havre tries to reintegrate southern neighbourhoods that were separated for a long time from the inner centre, like for Rotterdam with a north-south bridge; Barcelona and Genoa find new opportunities to solve high population densities.

<Figure 1-5> Spatial logics of development projects (Europe)



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5 APPLICATION ON ASIAN CASE

This chapter is an application of quantitative and qualitative methods on a sample of 58 Asian port cities including Incheon, Busan, and Ulsan. A cross analysis on Europe and Asia aims at showing more directly their major differences and answering the hypothesis raised in Chapter 1.

1. Quantitative analysis of the Asian port-city interface

1) Selection of sample cities

Same criteria as for Europe have been applied to build an Asian sample, in terms of population size of the metropolitan areas (200,000 inhabitants), container activity and geographical location (seaports). Like Europe, important and recent ports such as Jawaharlal Nehru in India, Port Muhammad Bin Qasim in Pakistan, Gwangyang in Korea and Laem Chabang in Thailand, could not be included as their population size in under the demographic criteria as port and urban functions are too much unbalanced.

As a result, the total population of the selected 58 port cities is of 264 million inhabitants, representing 26% of the population living in cities over 200,000 inhabitants, and almost 40% of world containerised shipments with a total of 97,208,910 TEUs and 6,363 direct calls from container shipping lines.

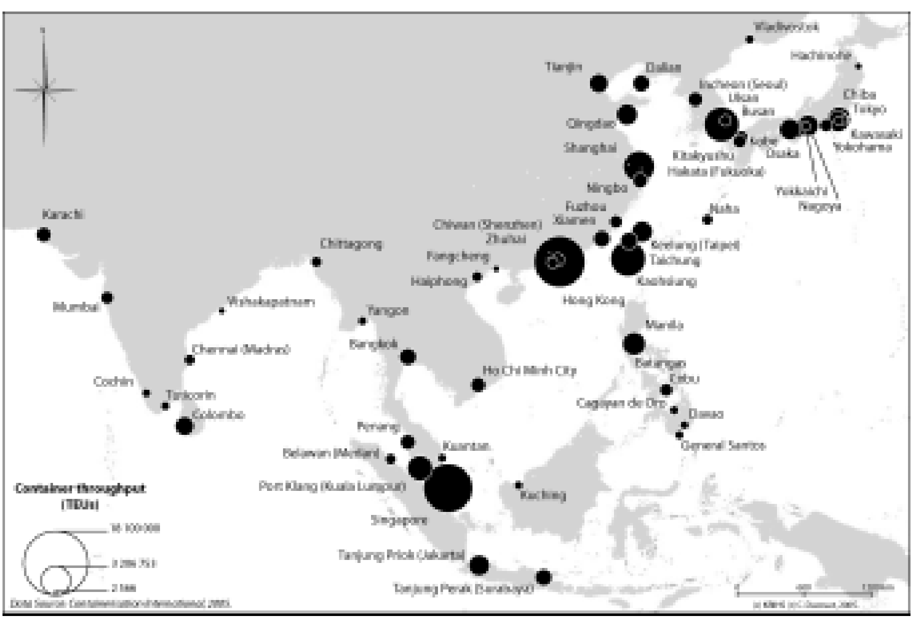
<Table 5-1> The selected 58 Asian port cities

PORT CITY	**COUNTRY**	**PORT CITY**	**COUNTRY**
BANGKOK	Thailand	KAOHSIUNG	Taiwan
BELAWAN (MEDAN)	Indonesia	KITAKYUSHU	Japan
MUMBAI (BOMBAY)	India	KUANTAN	Malaysia
BUSAN	Korea	MANILA	Philippines
BATANGAS	Philippines	NAHA	Japan
CAGAYAN DE ORO	Philippines	NINGBO	China
CEBU	Philippines	NAGOYA	Japan
CHITTAGONG	Bangladesh	OSAKA	Japan
CHIBA	Japan	PENANG	Malaysia
CHENNAI (MADRAS)	India	PORT KLANG (KUALA LUMPUR)	Malaysia
COLOMBO	Sri Lanka	QINGDAO	China
COCHIN	India	MUARA	Brunei Darussalam
CHIWAN (SHENZHEN)	China	HO CHI MINH CITY	Vietnam
DALIAN	China	SHANGHAI	China
DAVAO	Philippines	SHIMIZU	Japan
FANGCHENG	China	SINGAPORE	Singapore
FUZHOU	China	TANJUNG PERAK (SURABAYA)	Indonesia
GENERAL SANTOS	Philippines	TANJUNG PRIOK (JAKARTA)	Indonesia
HACHINOHE	Japan	TIANJIN	China
HAIPHONG	Vietnam	TUTICORIN	India
HAKATA (FUKUOKA)	Japan	TAICHUNG	Taiwan
HONG KONG	China	TOKYO	Japan
INCHEON (SEOUL)	Korea	ULSAN	Korea
JIUZHOU (ZHUHAI)	China	VISAKHAPATNAM	India
KARACHI	Pakistan	VLADIVOSTOK	Russian Federation
KAWASAKI	Japan	XIAMEN	China
KOBE	Japan	YANGON	Myanmar
KUCHING	Malaysia	YOKKAICHI	Japan
KEELUNG (TAIPEI)	Taïwan	YOKOHAMA	Japan

Maps 5-1 and 5-2 show that population and container throughput's distribution is very heterogeneous among Asia. However, like Europe, container throughput is much more concentrated than population.

<Map 5-1> Population of Asian sample cities (2005)

<Map 5-2> Container throughput of Asian sample cities (2005)



2) Description of main factors

As we have proceeded with the European case, a factor analysis is depicting the Asian port cities according to exactly the same criteria and data sources, that are provided in the Annex. Factor analysis brings interesting trends concerning our sample of Asian port cities. Four main factors have been identified, accounting for almost 84% of the original information (Tab.5-2). Each factor will be described successively, according to the indicators involved in its profile.

<Table 5-2> Four main (Asian factor analysis)

	F1 (53.87%)	**F2** (13.63%)	**F3** (10.77%)	**F4** (5.71%)
> 0	**POPMET (11.00%)** QUALEN (10.35%) CONBUS (10.22%) DIRCAL (9.23%) TEUTRA (8.76%)	**HIGHWA (25.26%)** RAILWA (21.15%) METARE (7.43%) POPMET (1.86%) POPADM (0.87%)	**MAXDEP (20.99%)** TERLEN (6.77%) HIGHWA (6.70%) QUALEN (5.96%) DIRCAL (3.97%)	**POPSUB (51.46%)** POPMET (10.39%) CONBUS (0.65%) MAXDEP (0.57%)
< 0	-	MAXDEP (2.30%) TERLEN (5.26%) DIRCAL (8.50%) FORBUS (11.33%) **TEUTRA (14.99%)**	POPMET (3.10%) CONBUS (7.20%) METARE (10.47%) POPADM (11.33%) **FORBUS (17.28%)**	TEUTRA (2.07%) HIGHWA (2.39%) RAILWA (3.80%) FORBUS (4.05%) **POPADM (23.09%)**

- Port-city concentration (F1) is a hierarchical trend which ranks port cities according the concentration of overall demographic and port mass (POPMET and QUAYLEN), followed by container-related activities (CONBUS), foreland connections (DIRCAL) and container throughput (TEUTRA). It is interesting to notice that compared to Europe, the Asian hierarchy is based on very general indicators, while

European hierarchy (F1) is based on transport businesses. However, the two hierarchies are similar in their logic and both express a **concentration of both port and urban functions**.

- Port-city opposition (F2) marks same characteristics for Asian and European port cities, with the recurrent port/city opposition between on one side port-related indicators like throughput (TEUTRA), freight forwarders (FORBUS), foreland connections (DIRCAL) and, on the other, land connections (HIGHWA, RAILWAY) and urban mass (METARE, POPMET). We can interpret this trend as an **opposition between port specialisation and city size**.

- Port-city specialisation (F3) is, like for the European case, an **opposition between land-sea accessibility and tertiary attractivity**, with on one side container terminals' depth and length (MAXDEP, TERLEN), highway connections (HIGHWA) and, on the other, the location of transport services (FORBUS and CONBUS) and population (POPADM and POPMET).

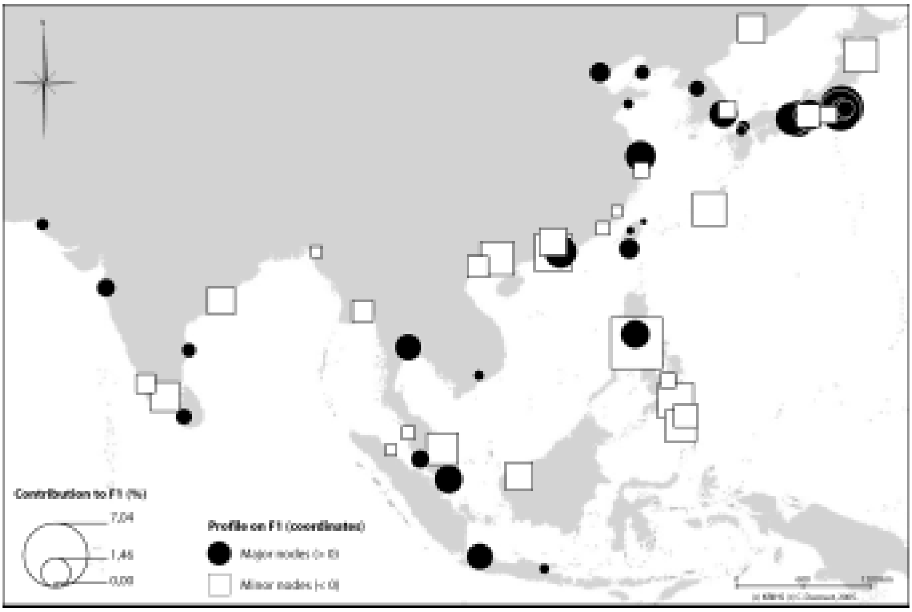
- Port-city combination (F4) is also comparable to the European **opposition between nodality and connectivity**. On one side, some cities are defined by their urbanisation level (POPSUB, POPMET), while others welcome trade and physical networks (FORBUS, HIGHWA, RAILWA, TEUTRA) connected to inner city (POPADM). Nodality expresses a local 'mass' while connectivity expresses a property to be inserted within networks.

3) Spatial profile of main factors

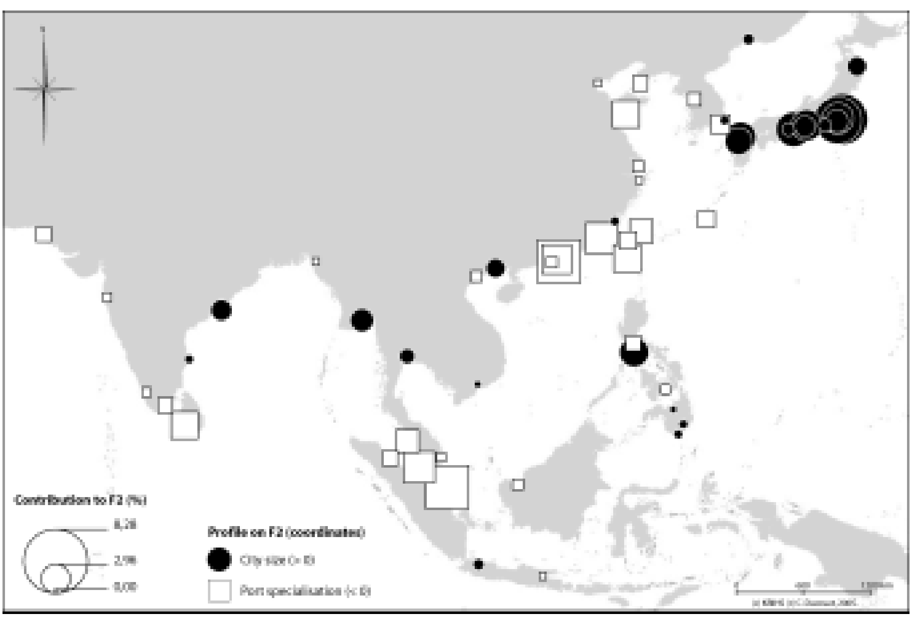
As an effect of F1 structure, there is a concentration of major nodes in north-east Asia (Japan, Korea and the Yellow sea).

Other major nodes are well-known container ports and metropolises: Shanghai, Hong Kong, Taiwan (mostly Kaohsiung), Manila, Bangkok, Singapore, Port Klang (Kuala Lumpur), Tanjung Priok (Jakarta), Colombo, Chennai (Madras) Bombay (Mumbai).

<Map 5-3> F1 profile (Asia)



<Map 5-4> F2 profile (Asia)



These port cities have dominant positions in Asia as both major ports and majors cities, as they combine both port infrastructures, urban population and transport activities. Minor nodes are usually small ports and small cities at the same time at this geographical scale.

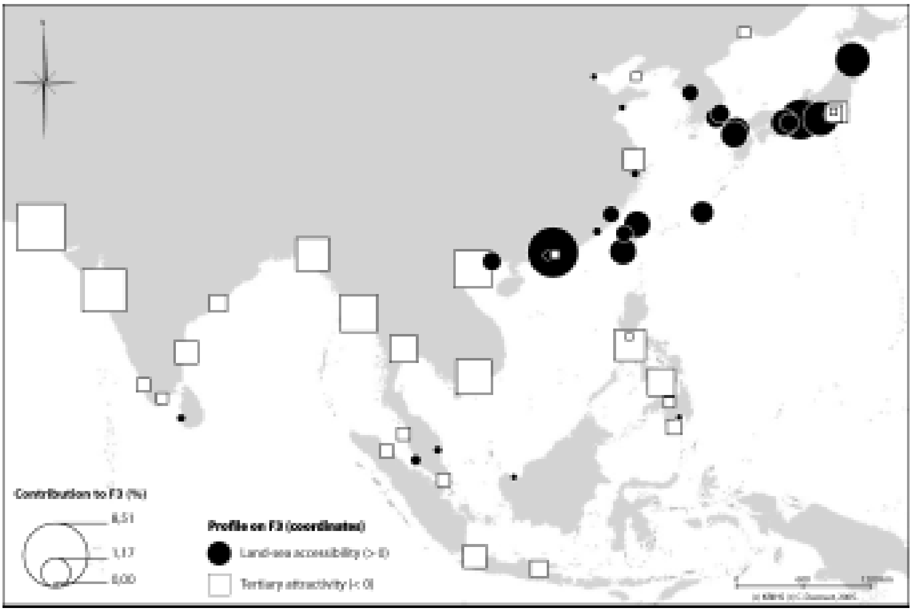
The opposition between “Asian corridor” and “major metropolises” (F2) gives more detailed information about the relative importance of port and urban functions. The ‘port specialisation’ trend shows to what extent port activity is operating in opposition to the size of the urban settlement, in terms of terminal accessibility, foreland connections and throughput. We can observe the ‘Asian maritime corridor’ from Singapore (or Colombo) to Busan and the Yellow sea. The port cities characterised by ‘city size’ include all Japanese ports, and some major port metropolises of South Asia (Visakhapatnam, Yangon, Bangkok and Manila).

A sub-regional opposition between accessibility and attractivity (F3) marks a division between North-East and South Asia. A basic reason is that north-eastern cities are more developed than southern ones in terms of land connections. Southern cities are thus characterised by a lack of accessibility on the land side, that reinforces their role as economic centres more than intermodal centres.

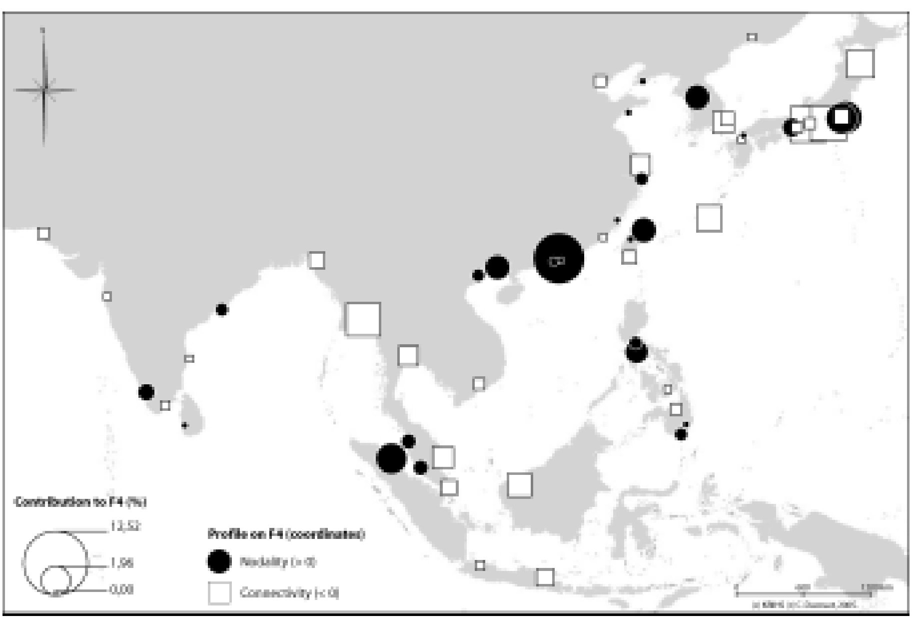
Some exceptions like the Tokyo metropolis in North-East Asia is explained by the welcoming of numerous companies attracted by the global city. The case of other Japanese cities might also be interpreted by past over-investment in land connections, and also by the fact that Japanese port cities are also able to realize intermodal transport. Hong Kong and Singapore, inversely, are more defined here by their ability to attract businesses than to connect various modes, as “Island City-States” with limited access to mainland markets (Malaysia, China).

The last profile (F4) has lower geographical significance, as both trends (nodality and connectivity) are crossing throughout Asia.

<Map 5-5> F3 profile (Asia)



<Map 5-6> F4 profile (Asia)



4) Port-city interface typology

By looking at crossed trends (Tab.5-3), interesting profiles appear. The major nodes (F1 > 0) appear in bold in the table. For example, Incheon and Busan are specialised and less attractive than accessible for the international economy.

<Table 5-3> Classification of Asian port cities

	CITY SIZE	PORT SPECIALISATION	
ATTRACTIVITY	**Chiba, Kawasaki**, Batangas, General Santos, Visakhapatnam	**Dalian, Hong Kong Manila**, Belawan, Cochin, Haiphong, Penang	NODALITY
	Bangkok, Chennai, Ho Chi Minh City, Jakarta, Tokyo, Cagayan de Oro, Vladivostok, Yangon	**Karachi, Mumbai, Shanghai, Singapore, Surabaya**, Cebu, Chittagong, Tuticorin	CONNECTIVITY
ACCESSIBILITY	**Kobe, Kitakyushu, Yokohama**, Davao, Fangcheng, Fuzhou	**Colombo, Incheon, Keelung, Port Klang, Qingdao, Taichung**, Chiwan, Jiuzhou, Ningbo	NODALITY
	Hakata, Nagoya, Osaka, Hachinohe, Shimizu, Ulsan, Yokohama	**Busan, Kaohsiung, Tianjin**, Kuantan, Kuching, Naha, Xiamen	CONNECTIVITY

This could mean that Korea’s major coastal cities are very influenced by the level of port activity in their respective profile. Given the centralisation on the global city of Seoul, Incheon and Busan are here defined as ‘hubs’ or ‘gateways’, with relatively limited centrality and radiance for other activities (e.g. tertiary sector), despite their demographic weight in reality, which is not relayed by enough attractiveness. The next step is to propose a typology comparable with the European one, in spite of some difference in the content of the main factors. Next table is classifying major Asian nodes (F1 > 0) in the four categories defined earlier.

<Table 5-4> Typology of Asian port cities

	MAJOR NODES (F1 > 0)	SECONDARY NODES (F1 < 0)
GENERAL CITIES	**Hakata, Kitakyushu, Kobe, Nagoya, Osaka, Yokohama**	Davao, Fangcheng, Fuzhou, Hachinohe, Shimizu, Ulsan, Yokohama
INTERMODAL PORTS	**Dalian, Hong Kong, Karachi, Manila, Mumbai, Shanghai, Singapore, Surabaya**	Belawan, Cebu, Chittagong, Cochin, Haiphong, Penang, Tuticorin
MARITIME CITIES	**Bangkok, Chennai, Chiba, Ho Chi Minh City, Jakarta, Kashima, Tokyo**	Batangas, Cagayan de Oro, General Santos, Visakhapatnam, Vladivostok, Yangon
GATEWAYS	**Busan, Colombo, Incheon, Kaohsiung, Keelung, Port Klang, Qingdao, Taichung Tianjin**	Chiwan, Jiuzhou, Ningbo, Kuantan, Kuching, Naha, Xiamen

- General port cities (city size and accessibility): defined by a mass of urban and port infrastructures as opposed to port specialisation and transport services' attraction. These port cities might be the result of enormous planning procedures but that have reached some limits in their development, as container lines and transport operators chose different locations. They are also defined by a wide range of activities and their economy is highly diversified as opposed to port and transport specialisation.

- Intermodal ports (port specialisation and attractivity): these cities are enjoying a ‘double’ insertion in both container lines and firms’ networks of transport operators.

- Maritime cities (city size and attractivity): defined by an urban mass and a high level of attractivity for international transport companies; here the port function may not be efficient but it is the ‘centrality’ of the cities which is preferred for the firms’ location.

- Gateways and hubs (port specialisation and accessibility): in this category, an efficient port activity is mostly based on the provision of massive port infrastructures; the effect is to lower the place’s attractiveness in general and lead to severe shortages of available land for the city development.

As Incheon and Busan fit together in the same category, and are thus comparable to European major port cities like Genoa and Le Havre for overall profile, the research undertakes the application of previous qualitative methods to highlight local and regional structures and spatial patterns of the two cities.

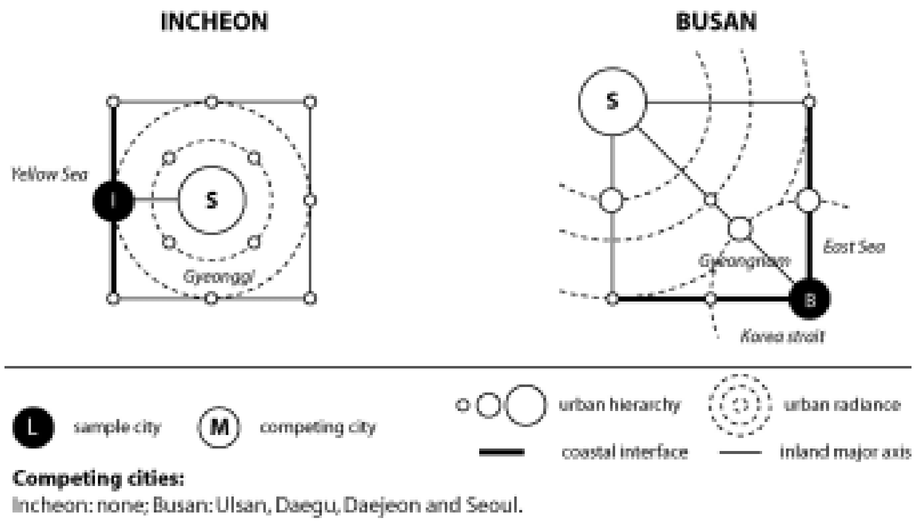
2. Qualitative analysis of Korean ports

1) Regional level

In terms of relative position within urban systems (Fig.5-1), Incheon and Busan are sharing some interesting aspects with our European sample. The case of Incheon might be compared to the one of Le Havre, as well as Rotterdam and Liverpool that both are inserted in a major ‘urban region’ (proximity of the port to an extended urban region) but whose ports are giant compared to Incheon.

The dependance on the capital region is a fundamental aspect for funding Incheon existence. The only difference between Incheon and Le Havre being the distance to the capital region, with Le Havre – Paris corridor (railway and Seine river) while Seoul remains focused mostly on Busan for its market. Busan is a bigger city on its own, and the urban system is similar to those of Barcelona (dynamic coastal industrial region with some autonomy compared to the capital city's domination in tertiary activities). Then the port is not only serving one distant city but also a local and regional market.

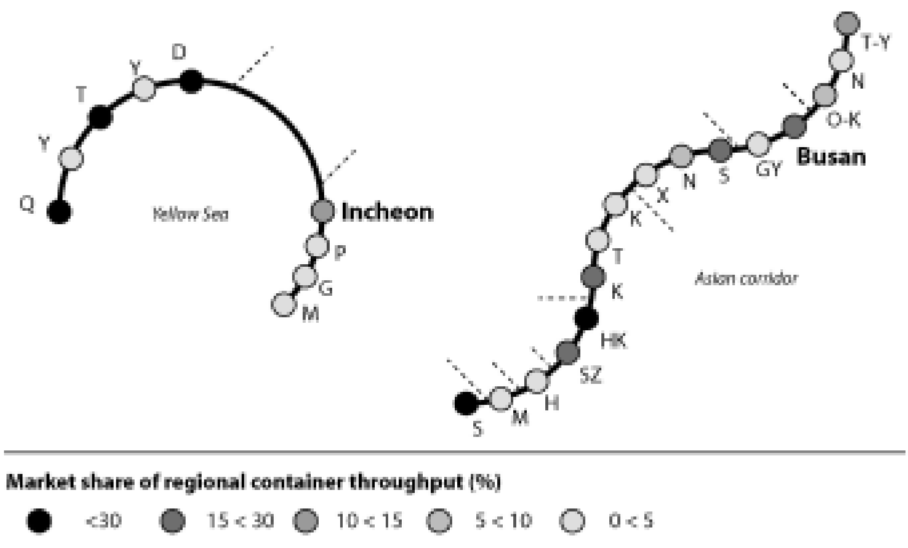
<Figure 5-1> Regional urban structure of Korean port cities



The 'Asian corridor' for Busan may not be well understood if not considered as one main trunk line integrated within global networks and the world's major hub port cities (Singapore – Tokyo-Yokohama). This corridor is the main axis for container movements, and has been **benefiting to Busan** (9%) and more recently Gwangyang (1%) to the expense of Japanese ports like Osaka-Kobe (2,8%), Nagoya (1,7%), Tokyo-Yokohama (4,8%) and Taiwanese ports such as Kaohsiung (7,9%), Keelung (1,6%) and Taichung (1%). Still the main hubs of Hong Kong (17,9%) and Singapore (16,7%) dominate the market but the rise of major Chinese ports such as Shanghai (11,8%) and Shenzhen (8,9%) might put in question the future of Busan, Hong Kong and Singapore hubs.

Numbers have to be handled carefully as most ports in this area are doubling their throughout thanks to transhipment volumes. Transhipment operations refer to containers moved from one ship to another, and are thus counted two times as they are not either imports nor exports but purely resulting from shipping lines strategies to concentrate their fleet (mother vessels) and redistribute containers through smaller vessels (feedering). For the Yellow sea case, a secondary basin within East Asia, it enjoys high volumes for bulk materials (northern China). As an effect, **Chinese ports dominate the container market** with Qingdao (41,7%), Tianjin (31%) and Dalian (18%), as Incheon (7,5%) plans new facilities to improve its low accessibility for containers and its role as a feeder port for this basin. Still Pyeongtaek (1,2%) and Gunsan (0,5%) have a very minor role in this respect.

<Figure 1-2> Regional port structure of Korean port cities

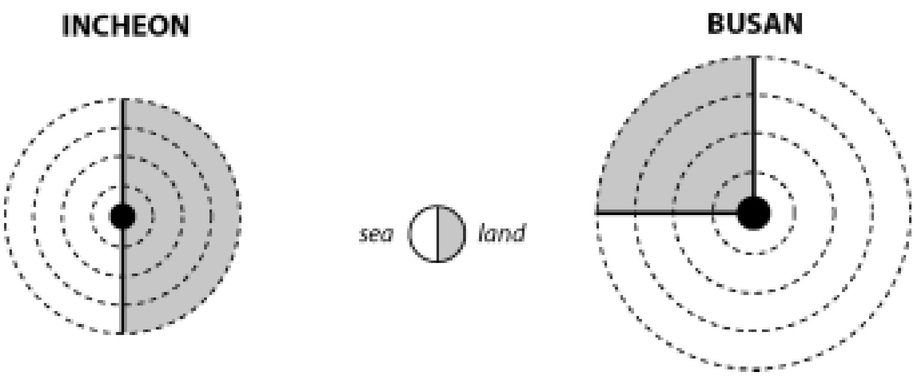


2) Local level

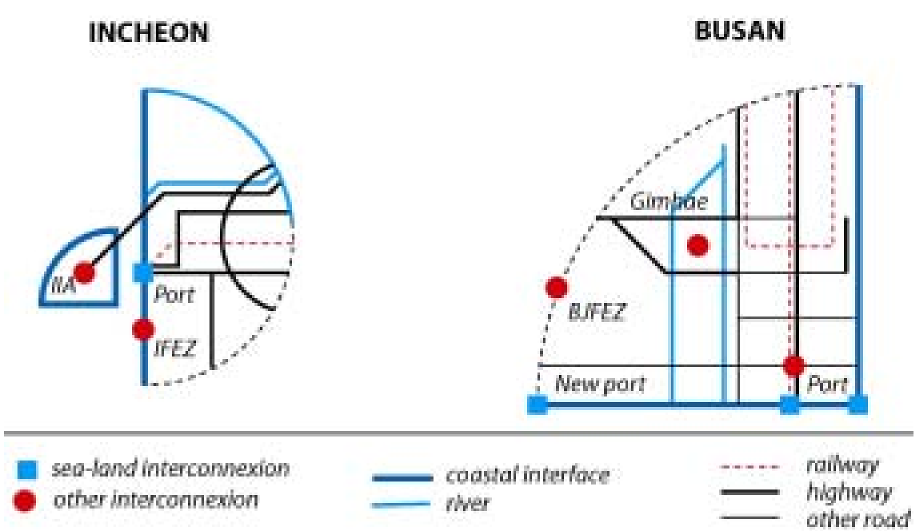
The basic morphology shows that Incheon is comparable with Barcelona, Genoa, Gdansk, as a linear city constrained by seafront, but Busan is more like Le Havre or Southampton, constrained by both sea and water (Nakdong river, green belt). Given the density of population, such constrained morphologies give a strong difficulty to port activities as land is not directly available.

The interconnections show that Incheon is at the end of a major corridor (Gyeongin industrial region), with the transport connections centring on the port area.

<Figure 1-3> Local urban morphology (Korea)



<Figure 1-4> Local interconnection of transport modes (Korea)



Even if its port function if comparatively less important than for Rotterdam and Le Havre, and its profile more diversified as a 'intermodal port' (Pentaport), Incheon seems to belong to 'gateway cities' in terms of land connections. According to port functions Incheon is still having been planed as the gateway of Seoul, even though Busan and Gwangyang catch much more volumes to and from the capital region. The case of Busan might fit into the European case of 'separation', with its high concentration on a limited space (e.g. effect of physical morphology and environmental limitations for suburban development), mostly around the port area with a concentration of transport connections towards northern areas (railways).

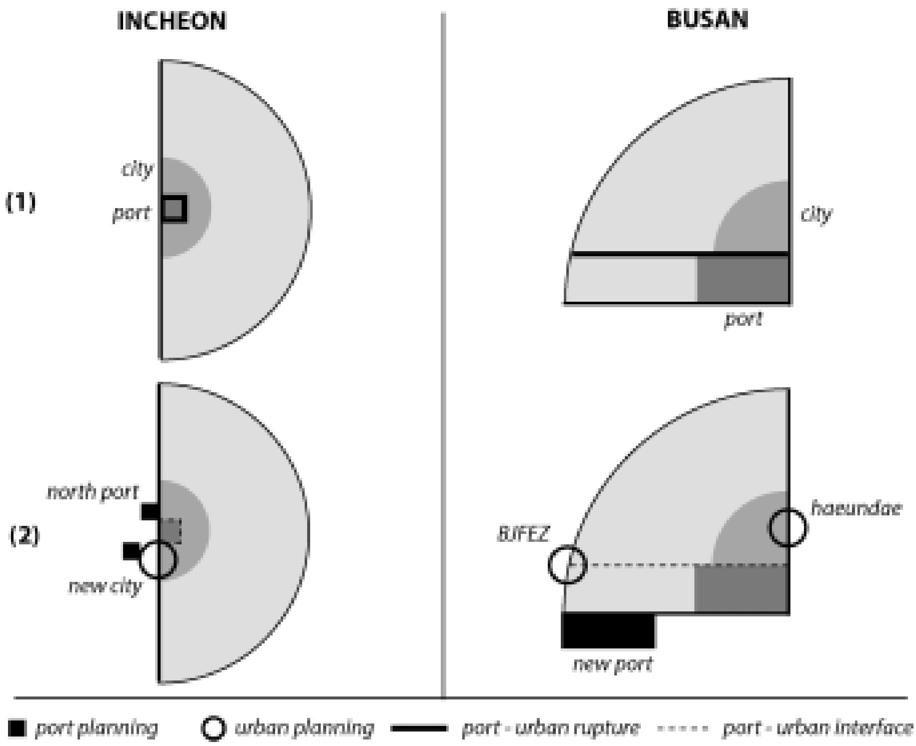
<Table 5-5> Korean port cities' development projects

	PORT	URBAN	TRANSPORT
INCHEON	North Port development Pentaport project	Incheon FEZ	Gyeongin Canal
BUSAN	Busan New Port	Busan-Jinhae FEZ	KTX link

The projects led in Incheon and Busan are of larger scale than usual projects in European port cities. While looking at their spatial logic, we can underline a few trends related to our topic. Compared to European projects, in Incheon there is a shift of centrality in the southern part of the city, with Songdo Inpia (new town). After a long period of dependency upon Seoul capital, Incheon is now benefiting from such proximity by catching high level activities (international airport, research and development activities). Then Incheon's pattern is evolving from a 'gateway' shape, with the Gyeongin corridor (cf. Le Havre) to more equilibrium thanks to transport links in the north (Gyeongin canal, highway to the airport) and in the south (3rd expressway). In Busan, it seems that urban and port projects are shifting in opposite ways, with the Haeundae new town in the East, and the Busan New Port / BJFEZ in the West.

It is a sign of local competition and dysfunction between port and city authorities, who are constrained to bypass a real planning at the port-city interface. This might increase the 'divided city' profile of Busan, but also lower the 'gateway city' profile as trucks from and to the port shall not concentrate within the city roads like before. More efficiency in inner city transportation, between cars and trucks, is a first achievement possible but there is a risk for increased physical separation at the port-city interface.

<Figure 1-5> Spatial logics of development projects (Korea)



3. A cross-analysis of European and Asian port cities

Following two analysis of European and Asian port-city interface, we undertake a cross-analysis based on the 13 indicators and the 127 cities. Such an analysis will give complementary answers to our hypothesis on differing spatial structures in Europe and Asia.

1) Description of main factors

The cross-analysis accounts for 78% of original data information with four main factors (Tab.5-6), whose structure is very similar to the former analysis on separate areas. The indicators' codes meaning is to be found in Tab.3-2. Each factor shall be interpreted as follows:

<Table 5-6> Four main factors (Europe-Asia factor analysis)

	F1 (49.91%)	**F2** (12.90%)	**F3** (9.58%)	**F4** (5.86%)
> 0	**CONBUS (11.27%)** DIRCAL (10.14%) POPMET (9.85%) TERLEN (8.71%) QUALEN (8.67%)	**RAILWAY (25.07%)** HIGHWA (22.60%) METARE (9.08%) POPADM (2.54%) POPMET (1.30%)	**MAXDEP (16.05%)** RAILWA (14.82%) HIGHWA (11.91%) QUALEN (7.78%) TERLEN (6.11%)	**POPSUB (37.34%)** POPMET (11.54%) MAXDEP (10.28%) TERLEN (0.95%) DIRCAL (0.27%)
< 0	-	FORBUS (2.01%) TERLEN (7.68%) MAXDEP (8.53%) TEUTRA (9.80%) **DIRCAL (10.11%)**	FORBUS (0.91%) METARE (1.90%) POPSUB (9.72%) POPADM (14.76%) **POPMET (15.56%)**	TEUTRA (3.65%) POPADM (3.76%) METARE (4.86%) CONBUS (7.60%) **FORBUS (19.60%)**

- Port-city concentration (F1) combines both port and city attributes, with container-related businesses (CONBUS) as the most important indicator for ranking port cities, followed by foreland connections (DIRCAL), metropolitan population (POPMET) and port infrastructures (TERLEN and QUALEN). Cities ranking well on this factor have enjoyed a multiple development of both maritime and urban functions, as showed in the matrix (Figure2-1), through a combined hierarchy of port-city functions.

- Port-city opposition (F2) opposes land connections (RAILWA, HIGHWA) and urban characteristics (METARE, POPADM, POPMET) to maritime networks (DIRCAL, TEUTRA) and terminal characteristics (MAXDEP, TERLEN) on the other. We find again a classical division between port and urban functions, to be interpreted as an opposition between port specialisation and land connections.

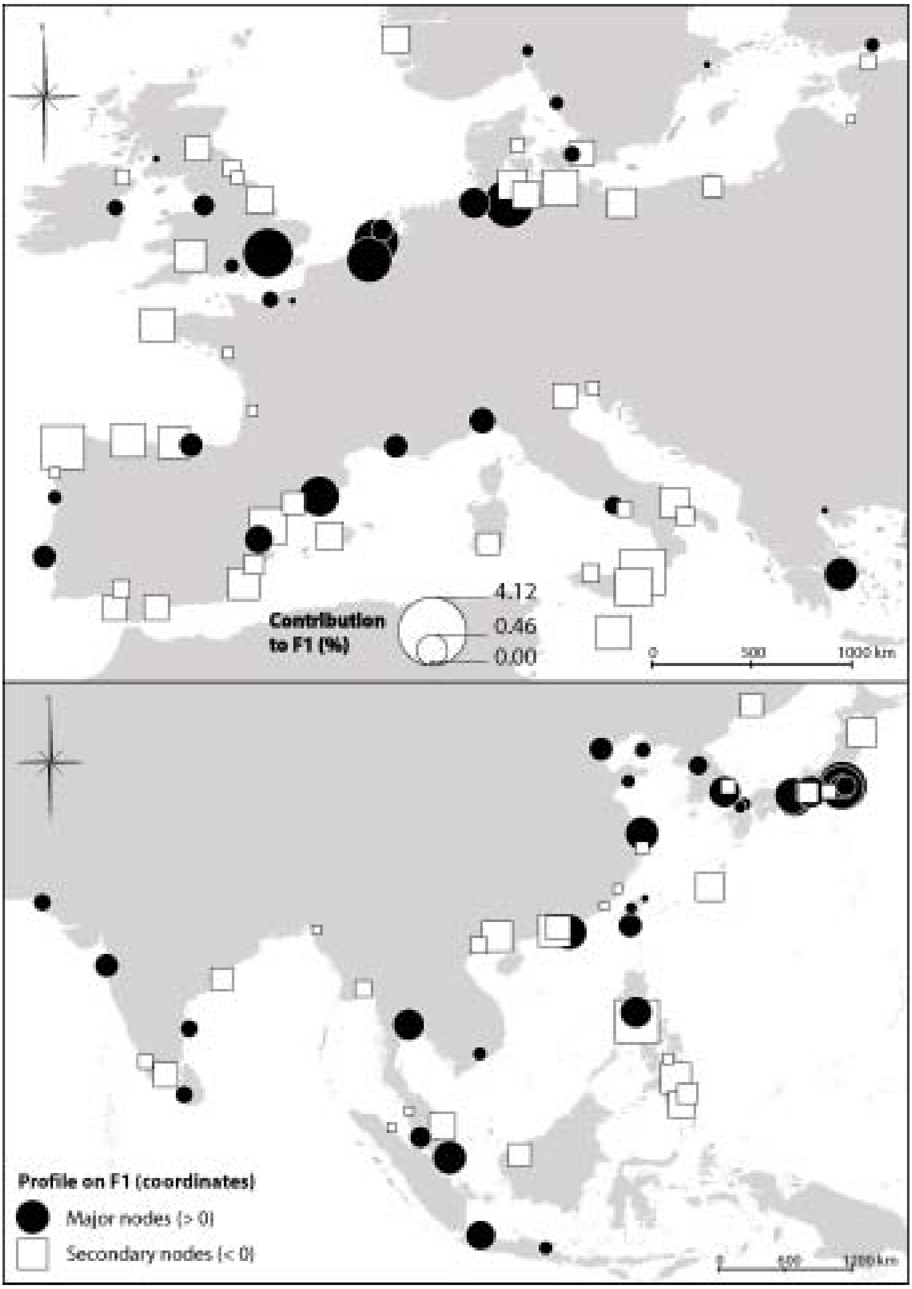
- Port-city specialisation (F3) is an opposition between terminal (MAXDEP, QUALEN, TERLEN), land (RAILWA, HIGHWA) accessibility and demographic importance (POPMET, POPADM, POPSUB, METARE). This is to be interpreted as an opposition between land-sea accessibility and city size.
- Port-city combination (F4) opposes the combination of demographic mass (POPSUB, POPMET) and terminal accessibility (MAXDEP) to the combination of logistic activities (FORBUS, CONBUS) and urban characteristics (METARE, POPADM). Such trend might be interpreted as an opposition between nodality and tertiary attractivity, between the weight of the node and its effective insertion within the transport chain.

2) Spatial profile of main factors

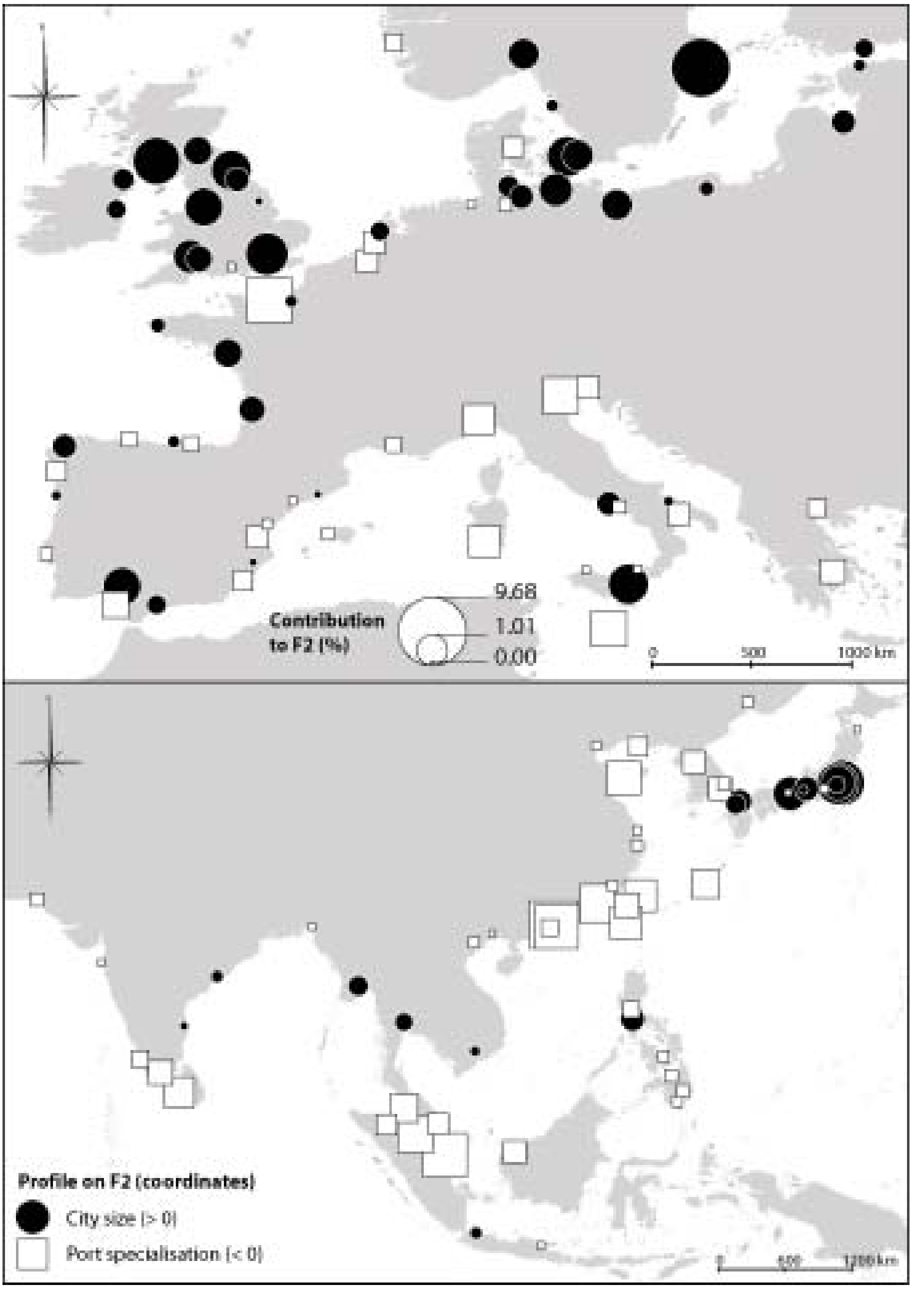
European ring and Asian metropolises (F1) show that "major nodes" in both continents are reflecting the intensity of trade and settlement concentration at the same time. Northern range and western Mediterranean ports are forming a powerful "ring" close to mainland markets. Asian major nodes' spatial distribution is more linear, but is slightly more concentrated in the North-East (e.g. Japan multifunctional port cities). The larger number of major nodes in Asia is partly confirming our hypothesis about the specific combination of Asian nodes, while such combination is less usual in Europe (only a dozen of major nodes among 69 port cities).

European gateways and Asian corridor are another remarkable difference (F2). Given the liberalisation of European markets and territory, a strong concentration on some gateways is the main feature of European port geography (Le Havre, Antwerp, Rotterdam, Hamburg, Genoa, Venice, Trieste).

<Map 5-7> F1 profile (Europe-Asia)



<Map 5-8> F2 profile (Europe-Asia)

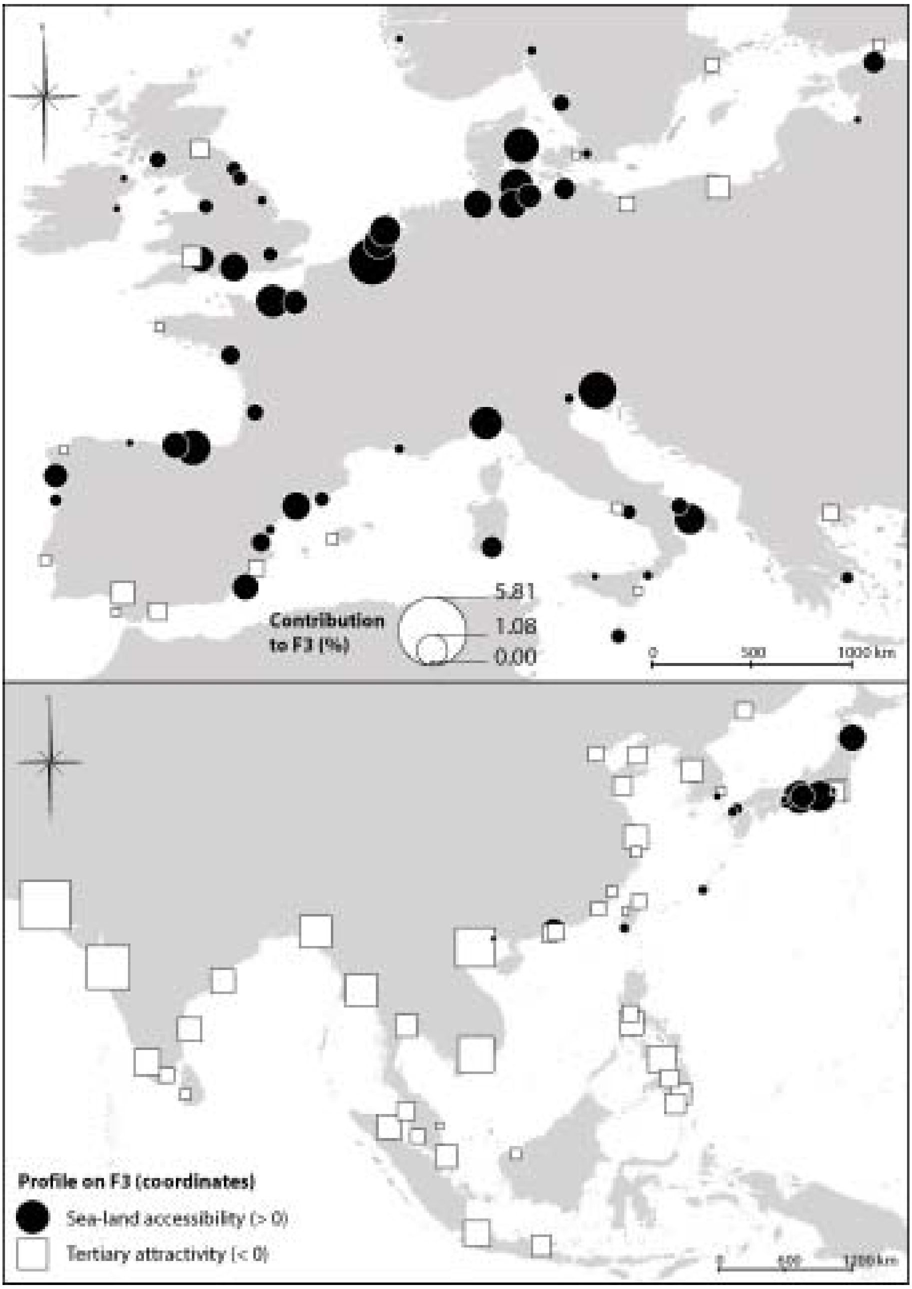


At the same time, port specialisation is more likely to appear in the south, where coastal settlements are less equipped with land connections, as opposed to a majority of northern and western cities (UK, Baltic sea, Atlantic façade). Le Havre is the most specialised port city as its population size is very small compared to its port throughputs, and remains poorly connected to mainland Europe as an indirect result of Paris domination.

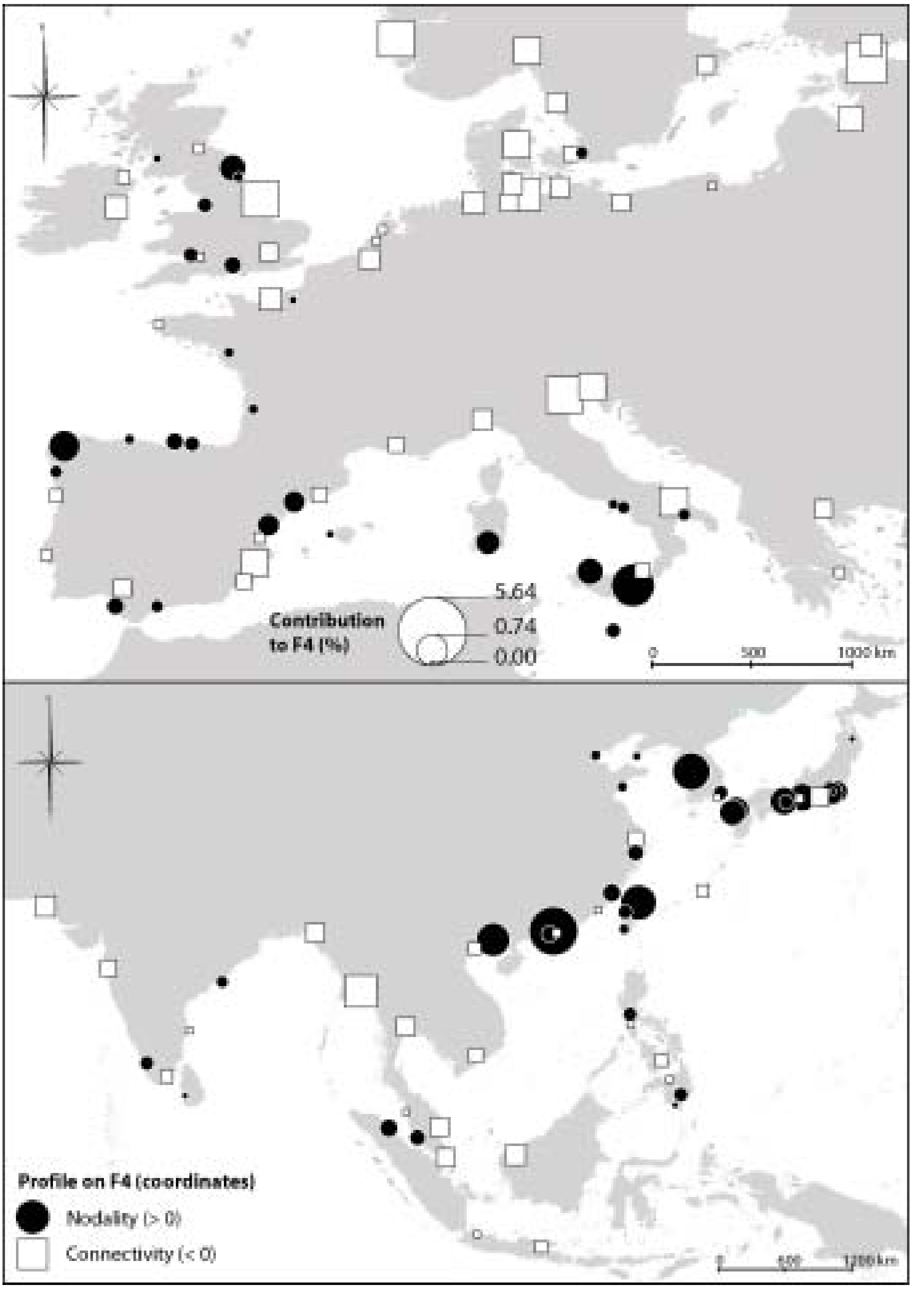
In Asia, we can observe a continuous clustering of specialised port cities along the "Asian corridor" (East-West trade major passage). The 'land connections' profile appears mostly in Japan and in some cities whose location is slightly remote from major shipping routes. For these cities, especially the few southern ones (e.g. Yangon, Bangkok, Jakarta), the port function is lower than land connections even though the city is poorly connected to land networks. Japanese cities, at the exception of Kobe and Shimizu, form the so-called megalopolis with a high density of transport networks.

Another way of comparing European and Asian ability of transport connections, is to look at the spatial profile of F3. First of all, this shows the most important difference between the two regions: the relative importance of land transport, not only for port cities themselves but for the whole continent. Beyond obvious consideration on physical advantages and/or limitations to land transport (European territory homogeneity and Asian maritime disrupts), it is very interesting to confirm that most European port cities enjoy high levels of accessibility for both land and sea connections, while a majority of Asian port cities are here defined as "attractive for businesses". In fact, the level of attractivity might be lower in reality, and should be interpreted here as a lack of inland connections rather than a real attractiveness for service activities. This also confirms our hypothesis on continental differences, as usual Asian port cities are immediate markets for port activity, with a limited need for inland penetration, apart from a single highway / railway. Some exceptions appear, mostly due to the Japanese case (together with Chiwan in Shenzhen) where the amount of connections between coastal major centres are enormous despite the country's island shape. Japan is also one of the only Asian countries to be able to realize intermodal junctions between different transport modes.

<Map 5-9> F3 profile (Europe-Asia)



<Map 5-10> F4 profile (Europe-Asia)



F4 shows another sub-continental differentiation with North-East Asia and Northern Europe as homogeneous areas where most port cities share the same profile. If a majority of North-East Asian nodes are characterized by “nodality”, characterised by a mass rather by the insertion within the transport chain, the same profile affects a number of southern and Atlantic European port cities, which are designated often as ‘peripheral’ compared to major ports.

In Asia, nodality might be interpreted as a stage of development where port cities plan for vast infrastructure, while such investment is not yet relayed by efficient international trade and connection. In Europe, this is more a profile of remoteness given the lost competition with mainland gateways. Inversely, port cities characterised by “tertiary attractivity” are more located among south Asia, where land infrastructure is lighter and port cities act like ‘hubs’, relatively cut from their hinterland (e.g. Hong Kong, Singapore, Shanghai), and which are well inserting in multiple networks rather than accumulating infrastructures.

This trend seems inverted in Europe, with also a north-south divide of nodality and attractivity. Nodality marks a limited number of port cities, mainly in the Mediterranean basin (southern Italy and Iberian peninsula) together with some British ones (e.g. Southampton, Liverpool, Newcastle). Attractivity concerns a majority of European nodes, mostly in the northern part of the continent, but concerning also major port cities in the south. It means that in general, European port cities do not need a big urban-port mass to be connected to economic and logistic networks. Again, we can argue that for some of them, the remoteness and lower port function turns in favour of economic diversification and, for some others, this is an effect of core-periphery spatial pattern.

3) Synthesis of Europe – Asia cross analysis

A synthesis of Europe-Asia cross analysis (Tab.5-7) gives useful insight on the immediate differences to be learnt between European and Asian port cities. Our analysis shows above all **differing degrees of regional integration,** in terms of transportation and links within each continent. The continental level **shall not have operational**

value for individual cases, but for macro-regional structures to which individual are belonging. Main structures are summarized here in order to answer the hypothesis in Chapter 2.

- Major specialised port cities have different interface

It appears clearly that major European and Asian major port-city concentrations **do not share similar functions**. In table 5-7, where major port cities (F1 > 0) appear in bold, only few port cities of the two continents share similar profiles when factors are crossed.

For example, the major specialised port cities like Rotterdam and Le Havre have no equivalent in Asia apart from Busan and some other secondary nodes like Shimizu and Naha (Japan). It means that Busan is the only Asian port city sharing the same attributes than major European ports in terms of specialisation (F2), sea-land connections (F3) and attractivity (F4), in spite of its demographic weight. Such attributes are defined in opposition to city size.

Furthermore, major Asian specialised port cities like Incheon, Keelung and Port Klang have absolutely no equivalent in Europe as they are mainly defined by demographic weight, with city size (F3) and nodality (F4). It is also the case for Ulsan, where the size of the metropolitan area is more important than sea-land connections and insertion within the transport chain.

Still for “port specialisation” (F2) port cities, an interesting fact is that Hong Kong, Singapore and Shanghai, which are Asia’s major “hub port cities” (Lee, 2005), have a similar profile with Lisbon and Thessaloniki, both located in southern Europe. It means that in spite of their port specialisation, such cities are mostly important urban settlements that are well inserted in the transport chain, but lack of hinterland connections. When looking at Hong Kong and Singapore, it is true that their insertion in global transportation networks mainly come from their ‘hub’ function (exogenous) and remain poorly connected to the continent (Malaysia, mainland China). Shanghai also is likely to increase its hub function through the recent project of Yangsan. It is thus interesting to point at the fact that **only Mediterranean port cities might be compared to Asian hub port cities**.

<Table 5-7> Classification of European and Asian port cities

	CITY SIZE	PORT SPECIALISATION	
TERTIARY ATTRACTIVITY	**Naples**, Cardiff, Catania, La Coruna, Malaga **Chiba, Kawasaki, Yokohama**, Visakhapatnam	Cadiz, Palma **Colombo, Dalian, Incheon, Keelung, Manila, Port Klang, Qingdao, Taichung, Tianjin**, Belawan, Cochin, Davao, Fuzhou, General Santos, Jiuzhou, Ningbo, Ulsan	NODALITY
	Copenhagen, Helsinki, Stockholm, Alicante, Brest, Edinburgh, Gdansk, Sevilla, Szczecin **Bangkok, Chennai, Ho Chi Minh City, Jakarta**, Batangas, Yangon	**Lisbon, Thessaloniki** **Mumbai, Hong Kong, Karachi, Shanghai, Singapore, Surabaya**, Cagayan de Oro, Cebu, Chittagong, Haiphong, Kuantan, Kuching, Penang, Tuticorin, Vladivostok, Xiamen	CONNECTIVITY
SEA-LAND ACCESSIBILITY	**Glasgow, Liverpool, Rouen**, Bordeaux, Malmö, Nantes, Newcastle, Santander, Tees **Hakata, Kitakyushu, Nagoya, Osaka, Tokyo**	**Bilbao, Southampton**, Cagliari, Castello, Gijon, Palermo, Salerno, Tarento, Tarragona, Valletta, Vigo **Kaohsiung, Kobe**, Chiwan, Fangcheng, Hachinohe	NODALITY
	Amsterdam, Barcelona, Bristol, Dublin, Gothenburg, Leixoes, London, Oslo, Bari, Belfast, Kiel, Kingston, Lubeck, Riga, Rostock, Tallinn Yokkaichi	**Antwerp, Bremen, Genoa, Hamburg, Le Havre, Marseilles, Piraeus, Rotterdam, Valencia**, Aarhus, Bergen, Cartagena, Messina, Trieste, Venice **Busan**, Naha, Shimizu	CONNECTIVITY

Finally, Bilbao and Southampton, specialised ports with efficient sea-land connections but that are not well inserted in the transport chain, share a similar profile with Kobe, the only Japanese city in this category, and Kaohsiung, the major Taiwanese port. It is verified elsewhere that Kobe and Kaohsiung have been losing their former success since the past 10 years, given the competition from Korean hubs and Chinese ports.

<Table 5-8> Typology of European and Asian port cities

	AREA	MAJOR NODES (F1 > 0)	SECONDARY NODES (F1 < 0)
GENERAL CITIES	Europe	**Glasgow, Liverpool, Naples, Rouen**	Cardiff, Catania, La Coruna, Malaga, Bordeaux, Malmo, Nantes, Newcastle, Santander, Tees
	Asia	**Chiba, Hakata, Kawasaki, Kitakyushu, Nagoya, Osaka, Tokyo, Yokohama**	Visakhapatnam
INTERMODAL PORTS	Europe	**Bilbao, Southampton**	Cagliari, Castello, Gijon, Palermo, Salerno, Tarento, Tarragona, Valletta, Vigo
	Asia	**Colombo, Dalian, Incheon, Keelung, Manila, Port Klang, Qingdao, Taichung, Tianjin**	Belawan, Cochin, Davao, Fuzhou, General Santos, Jiuzhou, Ningbo, Ulsan
MARITIME CITIES	Europe	**Amsterdam, Barcelona, Bristol, Copenhagen, Dublin, Gothenburg, Helsinki, Leixoes, London, Oslo, Stockholm**	Alicante, Bari, Belfast, Brest, Edinburgh, Gdansk, Kiel, Kingston, Lubeck, Riga, Rostock, Sevilla, Szczecin, Tallinn
	Asia	**Bangkok, Chennai, Ho Chi Minh City, Jakarta**	Batangas, Yangon, Yokkaichi
GATEWAYS AND HUBS	Europe	**Antwerp, Bremen, Genoa, Le Havre, Lisbon Marseilles, Piraeus, Rotterdam, Thessaloniki, Valencia**	Bergen, Cartagena, Messina, Trieste, Venice
	Asia	**Bombay, Busan , Hong Kong, Karachi, Shanghai, Singapore, Surabaya**	Cagayan de Oro, Cebu, Chittagong, Haiphong, Kuantan, Kuching, Naha, Penang, Shimizu, Tuticorin, Vladivostok, Xiamen

It is also the case for the two European cities, which have in common to enhance their cruise activity and lose ground in the European container market (e.g. failure of the new port project 'Dibden Bay' in Southampton).

- sub-regional resemblance between the two continents

As for previous cases, the profiles marked by "land connections" do not show numerous combinations of European and Asian nodes. However, we see a more logical distribution of the cities within their continent.

For example, major Japanese port cities (F1 > 0) are absolutely not mixed with other Asian cities. Chiba, Kawasaki and Yokohama only share with Naples (Italy) a profile defined by the amount of land connections and the demographic weight; their participation to the transport chain appears limited in comparison with their 'mass'. Another group, composed of Hakata (Fukuoka), Kitakyushu, Nagoya, Osaka and Tokyo, which are the most important cities in Japan (megalopolis), share the profile of Glasgow, Liverpool and Rouen. Such European cities have in common a difficult participation to the European port system together with industrial decline. If we include the secondary nodes of Bordeaux, Malmo, Nantes, Newcastle, Santander and Tees, they all belong to the Atlantic Arc (except Malmo and Rouen), which is regarded as a peripheral portion of the European port system and territory as a whole. This might illustrate the fact that Japanese port cities have strongly developed but are more and more peripheral within Asian transport chain, in spite of their economic and demographic weight. Of course such assumptions have to be interpreted with caution but still, the Japanese case is showing a very particular behaviour compared to other Asian cities.

Another case with Bangkok, Chennai, Ho Chi Minh City and Jakarta as major nodes may be compared to Copenhagen, Helsinki and Stockholm, three northern European capitals defined by demographic weight (F3) and effective insertion in the transport and logistic chain, but at the same time lacking efficient sea-land connections.

- differences between cross analysis and previous analysis

When compared to previous analysis on Europe and on Asia separately, it appears that the cross analysis has some differences that deserve particular attention.

One notable difference is that some cities change their category once they are analysed in a direct Europe-Asia analysis. For example, many Asian “gateways” like Colombo, Incheon, Kaohsiung, Keelung, Port Klang, Qingdao, Taichung and Tianjin become “intermodal ports”. It can be interpreted by a loss of port efficiency, particularly because their attributes of “accessibility” and “connectivity” are changed to “attractivity” and “nodality”, which express more a weight than a dynamic compared to European nodes.

Inversely, most European “intermodal ports” become “gateways” in the cross analysis, like Rotterdam and most Mediterranean port cities (Lisbon, Marseilles, Piraeus, Thessaloniki, Valencia). It means that their demographic weight in the European analysis becomes relatively less important than their port efficiency in the cross analysis, in terms of “sea-land accessibility” and “connectivity”.

Finally, the two categories of “maritime cities” and “general cities” do not face such changes. It means that diversified cities of the two continents keep their initial profile. In return, we can interpret this by the fact that the key difference between European and Asian port cities comes from the port function and its ability to connect both transport modes and economic networks, not only for maritime purposes but also for their hinterland connections.

C · H · A · P · T · E · R · 6

6 CONCLUSION: POLICY IMPLICATIONS

This chapter consists in policy implications on the base of the results of this research. Improvement of port-city interface at both regional and local levels through spatial and economical equilibrium and integration, is here opposed to unbalanced and disconnected territorial patterns. Such implications are also used as guidance for Korean port-city planning.

1. The search for equilibrium at a regional level

1) A balanced insertion within urban and port systems

The main purpose of our research was to propose a multi-scale view of the port-city interface in Europe, to be compared with the Asian case. In this respect, our study is original compared to existing literature, for bringing such overview of the port-city issue, but also because it uses two approaches which are not often applied: quantitative analysis (factor analysis) and international comparison including also qualitative spatial analysis.

The main idea here is that planning projects should focus on a global aim for the whole port-city area, beyond the sole “waterfront” purpose. It means that port-city relationships shall not only be understood at a local level but also at a regional level. The future of port cities is highly dependent on their ability to enhance their position in urban and port structures at the same time, together with efficient planning for connecting areas and networks.

2) Implications for Korean port cities

The long term objective for Korean port cities is supposed to find out reasonable use of their potential by finding equilibrium between urban and port structures for more sustainability, which is exposed to the pressures from Seoul (national) and China / Japan (international). The Korean issue is thus embedded in multiple geographical levels as well, notably through containerisation, that reinforces the need for shaping innovative policies both at local (Cho and al., 2002), regional (Soo, 1990; Lee, 2002) and national levels (Kim, 2002), such as free trade zones and the 'North-East Asian Hub' strategy.

European 'gateways', defined by port specialisation, land-sea accessibility, connectivity, and serving major hinterlands, might give interesting policy directions for Korean cases. Especially Busan, which has a similar profile but which should also take advantage of being a major city of 4 million inhabitants. Nowadays, the lack of economic centrality and the prevalence of urban-port mass on connectivity are potential constraints for an efficient insertion within Asian regionalisation and, moreover, globalisation processes. In this respect, our quantitative analysis shows that the three Korean port cities of Busan, Incheon and Ulsan are all characterised by a dominant port function, that influences their own economy (specialisation) compared to other cities where port function is one among others and allows them to develop (e.g. service sector). It has been confirmed elsewhere in the literature, for example in the work of Hong (1996) showing that 96% of headquarters are located in the Seoul area.

The risk for Korean port cities is to become unattractive urban spaces whose port function is unable to dynamist, facing Seoul concentration and foreign neighbouring port-industrial poles.

2. The shift from waterfront planning to port-city planning at a local level

1) Spatial and economic integration

If the spatial separation between city and port seems necessary and ineluctable in the case of busy ports, still issues like value-adding deriving from port activities may profit to the urban economy (e.g. employment creation in logistic functions). At a local scale, this is made possible by multi user projects for mixed use between port, city and transport companies.

As we have showed already, port-city development should nor be confined geographically neither remain in the hands of one single actor for serving an unilateral strategy in the short term. In spatial terms, port-city planning has become a policy for joint benefits both for the port and the city. It means that projects are not confined within the waterfront, but have to serve the overall well being of the port city as a whole. The opportunity of port cities is thus to provide attractive space which development would in turn re-equilibrate the agglomeration. In this respect, port and urban decision-makers should work jointly at a larger perimeter than their own administrative boundaries, and include in their common project notions of accessibility (common use of transport junctions for commuting and freight) and social progress by using abandoned lands not only for luxury hotels, international tourism and recreation purposes but also for providing public services as housing and education.

According to the qualitative analysis, we saw in European cases that the planning of new ports and terminals cannot be enough for providing long term benefit. For example, Southampton, with its commercially oriented urban projects (recreation and consumption), has been looking at short term benefits. The private port's project of Dibden Bay has failed after public debate not only for environmental reasons but also because of a lack of homogenous vision of the whole port-city.

2) Implications for Korean port cities

The creation of additional terminals, disconnected from the city (Busan New Port, Incheon North Port), and of new town areas (Songdo Inpia, Haeundae), located away from the port, might accentuate the inner port-city interface dysfunction that has been observed by numerous scholars. For example, the spatial impacts of Korean port-city rapid growth have already put some threat on the port-city interface's efficiency and sustainability (Park, 1990; Cullinane and al., 1998; Kim and al., 2002). Rural exodus following rapid industrialisation has strengthen urban growth through a "semi-peripheral" model (Smith, 1981) with high growth rates outside of Seoul region. For example, Busan's urbanized area increased from 219 to 526 sq. km. between 1980 and 1990 (Ness and al., 1992). Some case studies on Busan (Frémont and al., 2004a, 2004b, 2005) and Incheon (Ducruet, 2005b) highlighted such problems and also the difficulty to diversify their local economy despite their demographic size and especially the rapid development of Busan port.

But because Korean port areas are still functioning according to their initial purpose, new developments have no other choice but to locate away from traditional port-city interface areas. However, new projects shall be integrated at a wider level (metropolitan area or "city-region"), so as to connect efficiently traditional structures to new ones, both spatially and economically.

We believe that the next step for Korean port cities will be to make a more efficient use of existing facilities not only for maritime trade but also for inland connections, through **negotiation about port-city common master plan**. In France for example, where port and city administration are separated, new planning documents like "port-city charters" (charte "ville-port") have emerged, and some planning projects such as the ongoing "Euromediterranée" project in Marseilles involve both City and Port. It is now well known that the most efficient ports in Europe are municipal ports (managed by the city council), like in the case of Germany (Hamburg), Belgium (Antwerp) and Netherlands (Rotterdam) for example. Elaborating a single planning document, under the responsibility of multiple locally-based players, seems essential to a betterment of port-city dialogue in Korea.

3. Limits and advantages of the research

It is also important to address here the limits faced by the present research. First of all, the multi-scale approach, as an objective to understand fully the issue of port-city relationships in both regions, did limit the full understanding of every geographical level involved. At a continental scale, for Europe and Asia, the research focused more on the descriptive results brought by macro-regional structures. Factor analysis, in this respect, cannot explain by itself the structure obtained, nor individual cases that participate to the global trend. Then our approach is more descriptive than explicative. At the local level also, the use of spatial models for making possible direct comparison of internal patterns and ongoing planning projects, could not provide fully detailed information on every port city studied, like it is the case in usual literature while focusing on one or two port cities.

Another difficulty of the research, which obviously limited the results desired, is the lack of detailed statistical sources at the scale of two continents. If on one side the data used covers both urban and port functions, it remains very poor compared to the reality of port and logistic activities. The reason is that global databases cannot provide very accurate data on industrial activities. As an example, available data for European port cities, on transport employment in more than 30 different activities, could not be used here as Asian equivalent data was lacking. This research, however, is a first step in the comparison of very distant and dissimilar places from two major port areas of the world according to qualified data from official sources.

Then, in spite of the limits brought by the methods used and by the lack of relevant sources, this research is still original and has no equivalent throughout the literature on ports and port cities. Nevertheless, further research is needed to improve the interpretation of the results, and to strengthen the database with more accurate data so as to express more in-depth results that could be used for the improvement of local and national policies.

S · U · M · M · A · R · Y

FRENCH SUMMARY

La présente recherche s'intéresse aux logiques spatiales des relations ville-port en Europe, dans une optique comparative avec le cas asiatique et notamment coréen. Le but de la recherche est de proposer un « miroir » dans lequel les décideurs coréens ont la possibilité de placer leurs stratégies en perspective. Cinq étapes successives constituent le corps du travail. D'abord, le chapitre premier met en relief les enjeux européens et asiatiques de la relation ville-port, ce qui permet de formuler des hypothèses sur les spécificités des deux régions, qui appellent à être vérifiées par la suite. Ensuite, une revue de la littérature spécialisée (second chapitre) précise le contenu du concept de « ville portuaire » et fait état des lacunes tant théoriques que pratiques à ce sujet, en vue d'une comparaison internationale. Les troisième et quatrième chapitres constituent le cœur de la recherche, s'occupant respectivement d'une approche quantitative (présentation des données et de la méthode utilisées, analyse factorielle proprement dite, cartographie des résultats et typologie), et d'une approche qualitative (principes de la modélisation graphique de la relation ville-port et application à un échantillon de huit villes européennes). Le cinquième chapitre se propose d'appliquer les mêmes méthodes à un échantillon asiatique, et se termine par un recentrage sur le cas coréen. Enfin, un dernier chapitre (chapitre six) fait le bilan des apports de la recherche tout en proposant des perspectives d'aménagement futur des villes-ports coréennes, autour de l'idée de complémentarité et d'équilibre entre fonctions et espaces de la ville et du port, en tant qu'enjeu majeur face aux pressions du transport international contemporain.

Chapitre 1 : Introduction

La question centrale est née de travaux antérieurs sur les problèmes propres aux villes-ports coréennes telles Busan, Gwangyang et Incheon, par rapport aux processus de mondialisation et d'intégration régionale auxquels la Corée du Sud a pris part de façon croissante. Dans cette idée, les auteurs cherchent à approfondir la connaissance de la question urbano-portuaire en Corée par l'élargissement du cadre d'analyse habituel. En particulier, la focale est placée sur le fonctionnement général des villes-ports européennes et sur la comparabilité des phénomènes observés avec l'Asie en général.

A partir d'un constat sur l'uniformisation croissante des problèmes rencontrés, nous proposons une série d'hypothèses sur les spécificités territoriales des deux régions étudiées. A titre d'exemple, le modèle spatial centre-périphérie qui semble régir en grande partie les relations ville-port en Europe repose sur une concentration continentale des marchés, tandis qu'en Asie la prégnance des concentrations urbaines littorales amène à des problématiques très différentes. De surcroît, la continuité territoriale (et commerciale) européenne permet l'émergence d'un système portuaire cohérent tandis qu'en Asie les ports continuent d'agir en fonction d'un marché surtout local et national (ex : modèle « colonial » des comptoirs et entrepôts, discontinuité terrestre). En conséquence, la plupart des villes-ports européennes desservant le continent sont en proie à une relation de dépendance qui réduit leur centralité et leur rayonnement dans le système des villes (spécialisation dans la fonction « transports »). Par contre en Asie, comme dans nombre de pays des « Suds », l'on assiste à une concentration urbano-portuaire souvent excessive sur les mêmes territoires, à différents degrés, créant des nœuds multifonctionnels caractérisés par une forte pression territoriale (croissance rapide et manque d'espace). Or malgré la différence de nature des relations ville-port esquissée ici, nous argumentons en faveur de stratégies territoriales similaires, autour d'un concept fédérateur de ville-port qui est à (re)définir par rapport aux travaux antérieurs.

Chapitre 2 : Travaux antérieurs sur la relation ville-port

Il apparaît que tant les géographes que les aménageurs et les économistes n'ont pas formulé jusqu'ici de définition consensuelle sur la ville-port. Malgré cette lacune, nous proposons quelques pistes de recherche basée sur un fonctionnement général de ce lieu particulier, selon l'idée d'une connexion entre le niveau local et le niveau mondial par l'intermédiaire de l'activité portuaire. Les concepts de centralité (centrality) et de réticularité (intermediacy) sont explorés afin d'éclairer deux principes universels que sont le dysfonctionnement spatial et la combinaison fonctionnelle. Cette recherche est donc aussi un cadre de travail visant à faciliter les comparaisons internationales, jusqu'ici peu développées car ce thème est encore majoritairement abordé sous l'angle des monographies régionales.

A travers un tel cadre, nous accordons une préférence particulière aux approches quantitatives, qui permettent d'élargir l'échelle d'analyse par la collecte de données comparables d'une ville à une autre. En particulier, les travaux de l'IRSIT et de l'équipe « Air & Sea » ont montré sur le cas européen les possibilités de mener de larges comparaisons afin d'approcher les logiques profondes de l'association (ou dissociation) ville-port à l'œuvre dans cette partie du monde, sous des angles différents. La présente recherche s'inspire également d'un regard à l'échelle mondiale sur 330 lieux, croisant des variables tant urbaines que portuaires et maritimes, et démontrant l'influence de la régionalisation du monde sur les profils individuels des villes-ports.

Chapitre 3 : Analyse quantitative des interfaces urbano-portuaires européens

Un échantillon de 69 villes-ports a pu être retenu, par rapport au seuil de 200 000 habitants et selon 13 indicateurs portant sur les fonctions urbaines (population administrative, métropolitaine, suburbaine ; connections ferroviaires, autoroutières) et de transport (activités liées au conteneur, transitaires et agent logistiques, infrastructures portuaires, connections maritimes et trafic portuaire). A partir des données recueillies, une analyse factorielle rend compte à 80% des indicateurs de départ, à travers 4 tendances remarquables : la concentration et l’opposition ville-port sont les deux tendances majeures, complétées par la combinaison et la spécialisation ville-port. La cartographie des scores factoriels permet de rendre compte des logiques spatiales qui sous-tendent les principes fonctionnels, de façon plus ou moins homogène dans l’espace européen. Par exemple, l’analyse confirme le groupement de ports spécialisés à faible rayonnement urbain à proximité des marchés intérieurs (ex : range nord du Havre à Hambourg), en plus d’une division nord-sud fondée sur l’importance inégale des économies locales dans la participation aux flux maritimes. Le croisement final des 4 tendances permet de jeter un regard assez complet sur notre échantillon, et de se rapprocher d’un typologie sans pour autant enfermer chaque port dans un profil figé. Ceci permet de se rapprocher de quatre « types » formulés en amont tels que : les *gateways*, spécialisés dans les fonctions de transport et au rayonnement urbain limité (ex : Anvers, Le Havre, Gênes), les *villes généralistes* dont la fonction portuaire est réduite par rapport aux autres fonctions (ex : Dublin, Londres, Oslo), les *villes maritimes*, qui associent un port moderne et un environnement urbain diversifié (ex : Barcelone, Bordeaux, Liverpool) et enfin les *villes intermodales*, lieux d’interconnexion des réseaux terre-mer (ex : Rotterdam, Marseille, Le Pirée).

Chapitre 4 : Analyse qualitative des interfaces urbano-portuaires européens

C’est à partir de ce tableau général que nous opérons un choix de 8 villes-ports, afin de recentrer la focale sur l’organisation interne des lieux qui sont les plus susceptibles de se rapprocher des problématiques observables en Asie. L’approche qualitative, basée sur une littérature assez mince traitant des modèles spatiaux ville-port, présentée en chapitre 1, est ainsi appliquée aux villes suivantes : Barcelone, Gdansk, Gênes, Le Havre, Liverpool, Marseille, Rotterdam et Southampton. La collecte d’un grand nombre d’information est synthétisée à travers la modélisation des villes-ports en quelques étapes telles que les réseaux urbain et portuaire (niveau régional) ; la morphologie urbaine, l’interconnexion, l’imbrication ville-port et la dialectique rupture / interface (niveau local). Au final les modèles spatiaux permettent d’évaluer les écarts entre chaque cas et le modèle général de la ville-port européenne. En particulier, les projets à l'interface de la ville et du port sont appréhendés spatialement afin de souligner leur impact à l'échelle de l'agglomération portuaire dans son ensemble.

Chapitre 5 : Application au cas asiatique

Les mêmes méthodes sont appliquées à un échantillon asiatique en deux temps : l'analyse factorielle (quantitative) et la modélisation graphique à partir du cas coréen (qualitative). Enfin, est esquissée une analyse croisée des deux régions.

Globalement, la structure des axes factoriels (83% de l'information originelle) est très similaire à la structure européenne, ce qui appuie l'hypothèse de phénomènes similaires observables au niveau mondial au-delà des contextes particuliers locaux, régionaux et nationaux (ex : opposition ville-port, accessibilité / attractivité…). La cartographie des scores factoriels fait apparaître quelques regroupements intéressants tels que le corridor asiatique (Singapour – Corée), la spécificité japonaise (masse urbano-portuaire) et de l'Asie du Sud (accessibilité terrestre limitée), les processus en cours comme l'imbrication ville-port (Chine, Inde). Pour la Corée, un profil commun à Busan, Incheon et Ulsan avec l'Asie du Nord-Est apparaît autour de l'accessibilité terre-mer, par opposition à l'Asie du sud caractérisée par l'attractivité tertiaire et donc la carence en connections terrestres.

L'analyse qualitative, si elle ne porte que sur deux cas coréens (Incheon et Busan), permet d'apporter quelques lumières sur les mutations en cours des territoires locaux. La logique spatiale des projets d'aménagement (nouveaux terminaux, zones franches) à l'interface ville-port se caractérise, à la lumière du « modèle » européen, par un certain éclatement des agglomérations (manque d'espace et pression foncière).

Enfin, l'analyse croisée Europe – Asie permet de souligner les spécificités respectives deux régions. Si l'analyse factorielle montre des tendances similaires aux analyses précédentes, la cartographie accentue certains aspects tels que : spécialisation portuaire accentuée au voisinage du « cœur » européen et beaucoup plus forte en Asie qu'en Europe généralement ; accessibilité terre-mer d'abord européenne et carence en Asie ; sous-ensembles régionaux (Europe du Sud et Asie du Nord-Est / Europe du Nord et Asie du Sud). Il en ressort qu'en général les « nœuds principaux » des deux régions sont difficilement comparables en raison de fonctionnements radicalement différents. Les villes japonaises se démarquent du reste de l'Asie par leur 'masse' et leur potentiel de connections intermodales, rejoignant par là les profils de l'Europe atlantique. Busan se rapproche des grands ports européens (ports d'hinterland) tandis qu'Incheon et Ulsan restent dans une catégorie purement asiatique, où la masse démographique prime sur l'efficacité portuaire. Enfin, il apparaît que les grands hubs asiatiques (Hong Kong, Singapour, Shanghai) ont un fonctionnement très différent des ports d'hinterland du nord, et se rapprochent plutôt des ports méditerranéens par le manque de liaisons terrestres (Lisbonne, Thessalonique).

Chapitre 6 : Recommandations politiques

Au vu du « miroir » européen, il est possible de proposer pour les villes-ports coréennes un cadre de réflexion à partir de leurs actuels atouts et faiblesses et en vue de répondre aux enjeux futurs qui se dessinent à l'horizon.

Il apparaît en premier lieu que les 4 villes-ports coréennes sont caractérisées par une fonction portuaire prédominante au niveau local, ce qui influence leur économie propre (spécialisation) par rapport à d'autres villes où la fonction portuaire demeure secondaire et permet à d'autres fonctions de se développer (ex : tertiaire). Cette tendance est partagée par la plupart des grands ports européens et asiatiques. Néanmoins, le manque d'accessibilité terre-mer et la prévalence de la masse du nœud sur son insertion dynamique dans les réseaux maritimes - et plus généralement économiques - sont des freins potentiels à une participation efficace à la régionalisation asiatique ainsi qu'à la mondialisation au sens large. Le risque pour les villes coréennes est de devenir des espaces urbains peu attractifs et que l'activité portuaire ne suffit pas à dynamiser, notamment face à Séoul et aux autres pôles industrialo-portuaires des pays voisins.

Le regard porté sur les mutations locales de l'organisme ville-port à Incheon et Busan, bien que très basique, laisse entrevoir la possibilité donnée aux deux ports de se diversifier au prix d'une séparation ville-port accentuée. Ainsi, comme dans de nombreux cas, le regain de centralité urbaine et le maintien de l’efficacité portuaire au sein de telles agglomérations doit passer par la séparation physique. Cependant séparation ne veut pas dire abandon d’un idéal d’intégration des fonctions même à distance, d’où la nécessité de ne pas déconnecter les projets actuels (zones franches, nouveaux terminaux) de la structure ancienne des villes et des économies régionales.

S · U · M · M · A · R · Y

KOREAN SUMMARY

유럽 항만-도시간 상호관계에 대한 분석과 아시아에의 적용

César Ducruet, 정 옥 주

본 연구는 제 1 장 서론, 제 2 장 항만-도시간 관계에 대한 기존의 연구, 제 3 장 유럽항만도시에 대한 계량적 접근, 제 4 장 유럽항만도시에 대한 정성적 접근, 제 5 장 아시아 항만도시에 대한 적용, 제 6 장 결론:정책적 함의 등 총 6 장으로 구성되었다.

제 1 장 서 론

먼저, 세계화 현상이 심화되면서 오늘날 항만도시가 직면하고 있는 공간적·경제적 문제점들이 유럽과 아시아에 비슷한 모습으로 나타나고 있음을 지적하고, 이러한 외양적 공통점들에도 불구하고 유럽과 아시아의 서로 다른 공간적 특성들(예를 들면 유럽과 아시아 대륙의 바다-육지의 지리적 배치, 항만도시의 공간적 분포, 지배적인 항만도시 유형, 당면하는 주요 공간문제 등)로 말미암아 서로 다른 항만-도시 공간유형이 형성되고 있을 것으로 가정하였다(그림 1-1). 그리고 이와 같은 가정에 기초하여 유럽과 아시아의 항만도시에 대한 비교분석을 수행하기 위한 본 연구의 전체적인 구성에 대해 설명하였다(그림 1-2).

제 2 장 항만-도시간 관계에 대한 기존의 연구

항만도시에 대한 기존 개념들을 검토함으로써 이들 개념들이 국제적 비교연구에 적합한지를 살펴보고, 최근의 경험적·정성적 연구들의 내용과 한계를 고찰하였다. 특히 수적으로는 많지 않으나 항만-도시간 관계에 초점을 맞춘 기존 연구들이 항만도시에 대한 정량적 분석에 필요한 지표와 기준을 선정하는데 유익한 자료들을 제공하고 있음을 밝혀내고, 이와 같은 경험적 연구 외에도 항만 도시들을 비교하는 또 다른 방법으로서 항만도시에 대한 공간패턴을 기술하는 모델에 대해 살펴본다.

제 3 장 유럽 항만도시에 대한 정량적 접근

사례 항만도시로서 인구가 20 만 이상이며, 컨테이너 화물 처리시설을 가진, 바다와 직접적으로 연결되는 69 개의 도시를 선정하여(표 3-1), 도시의 규모(인구, 면적), 항만·교통 관련 하부구조, 물동량·서비스 등에 대한 총 13 개의 변수(표 3-3)를 통해 요인분석을 한 결과, 총 4 개의 주요 요인(F1, F2, F3, F4)을 도출해 낼 수 있었다(표 3-3). 각 요인을 집중(concentration), 대조(opposition), 조합(combination), 특화(specialization)로 해석하고 그 공간적 패턴을 지도화 하고(지도 3-3, 3-4, 3-5, 3-6) 보충설명 하였다.

먼저 F1 요인(concentration)은, 이를 구성하는 변수들을 통해 유추하면 도시위계 상에서 항만도시가 갖는 서열로 해석된다. F(>0)은 주요 결절지(major nodes), F(<0)는 차하 결절지(minor nodes)로 볼 수 있다(지도 3-3).

F2 요인(opposition)에서는 항만특화(port specialization)와 도시규모(city size)라는 두 개의 패턴이 대조를 이루고 있다. 기능이 매우 특화 된 남유럽에 위치한 소규모 항만도시들과 이보다 더 큰 규모의 북유럽 항만도시들 간의 대조가 뚜렷하다(지도 3-4).

F3 요인(combination)에서는 대도시 없이 물동량이 많고 결절성(nodality)이 큰 유럽 북동부 항만도시들과, 대도시들로 연결성(connectivity)이 높은 두 패턴 간의 조합이 두드러진다(지도 3-5).

F4 요인(specialisation)은 육상-해운의 접근성(land-sea accessibility), 3 차 산업 유인력(tertiary attractivity)으로의 특화를 보여주고 있다. 중심-주변과의 대조가 명확한 패턴으로서, 항만 기능이 아닌 다른 3 차 산업에 대한 국제적 유인력이 큰 경우는 대개가 유럽대륙의 내륙부 시장에서 멀리 떨어져 있는 반면, 육상-해운과의 접근성(land-sea accessibility)이 우수한 도시들은 내륙부 시장과 근거리에 위치하는 경향을 보였다(지도 3-6).

제 3 장에서는 또한 이상의 내용에 근거하여 항만-도시 관계에 대한 유형분류를 시도하였다. F1 요인에서 주요 결절지(major nodes)로 분류된 도시들만을 대상으로, 유럽 항만도시의 패턴을 설명하는 변수들(도시규모, 항만도시 특화, 연결성, 결절성, 육지-해운 접근성, 3 차 산업 유인력 등)을 전부 고려하여(표 3-4), 일반도시(general cities), 해운도시(maritime cities), 통합교통항만도시 (intermodal ports), 관문도시(gateways) 등 총 4 가지 도시유형으로 분류를 시도하였다(표 3-5).

여기서 general cities 란 도시 전체경제에서 항만과 관련된 기능이 차지하는 비율이 낮고 전반적으로 기능이 매우 다원화되어 있는 도시를 말한다. 도시의 발전을 위해 더 이상 해운에 의존하지 않아도 되는 도시들로서 London, Gothenburg 등이 이에 속한다.

Maritime cities 는 도시인구가 많고 이 인구들의 대부분이 해운과 관련되어 있으나, 도시의 항만기능이 도시의 다른 기능들에 비해 비중이 작은 도시들로서 Amsterdam, Barcelona, Naples 등이 해당된다.

Intermodal ports 는 Lisbon, Marseilles 처럼 해운-내륙, 해운-해운 간 네트워크 등, 교통 네트워크에 특화되어 있는 도시를 말한다.

Gateway 는 효율적인 항만기능으로 특징적인 도시로서, 지역경제가 항만기능에 지배되고 있는 Genoa, Le Havre 등이 이에 속한다.

제 4 장 유럽 항만도시에 대한 정성적 접근

앞 장의 정량적 분석에 이어 여기서는 유럽 항만-도시간 관계에 대한 정성적 분석을 하였다. 주요 결절지이면서, 수도와 일정 거리를 두고 있는 총 8 개의 도시, 즉 Gdansk(이상 general city); Barcelona, Liverpool(이상 maritime cities); Marseilles, Rotterdam, Southampton(이상 intermodal ports); Genoa, Le Havre(이상 gateway)를 대상으로 하였다.

먼저, 8 개 도시들의 성격을 유형별로 간략하게 설명한 후, 각 항만도시의 공간패턴을 광역(regional) 수준과 국지(local) 수준에서 살펴보았다. 광역 수준에서는 사례 도시가 유럽대륙(또는 국가 단위)의 소권역 별 도시체계 위계상에서 갖는 순위(그림 4-2), 동일 소권역에 위치한 항만도시들 간의 컨테이너 시장경쟁(그림 4-2)을 고찰하고, 국지 수준에서는 항만도시의 공간적 형태, 교통하부구조의 입지와 도시공간 패턴간의 관계(그림 4-4), 사례 도시의 도시·항만 관련 개발계획이 도시공간 패턴에 미치는 영향(그림 4-5) 등을 간략하게 다루었다.

제 5 장 아시아 항만도시에 대한 적용

제 5 장에서는 앞의 요인분석과 정성적 분석의 틀을 아시아 항만도시들에 적용하고 있는데, 사례도시 선정기준과 요인분석에 사용한 변수는 앞의 유럽 항만도시에 대한 요인분석에서와 같다. 총 58 개 아시아 항만도시(표 5-1)에 대해서 4 개의 주요 요인을 도출(표 5-2)해 내고 이를 지도화 하였다(지도 5-3, 5-4, 5-5, 5-6).

유럽항만의 경우 사례 도시의 규모를 나타내는 concentration(F1), 도시규모와 항만특화간의 opposition(F2), 항만자체의 결정성과 도시로서의 연결성을 보여주는 combination(F3), 육상-해운 접근성과 3 차 산업 유인력으로의 specialization(F4)라는 순서를 보였다면, 아시아 항만도시의 경우에는 F3 과 F4 의 순위가 바뀌었다. 즉, combination 이 F4 가 되며 specialization 이 F3 이 되었다. 각 요인(F1, F2, F3, F4)을 구성하는 변수들의 종류나 배열은 유럽의 경우와 대동소이 하였다(표 5-2).

다음으로는 유럽 사례에 대해서와 마찬가지로 아시아 주요 항만도시를 general cities, intermodal cities, maritime cities, gateways 로 분류하였는데(표 5-3, 5-4), 주요 결절지만을 예로 들면 Kobe, Hakata, Nagoya, Osaka 같은 일본 항만도시들은 주로 general cities 에 속하였고, Dalian, Hong Kong, Shanghai, Singapore, Manila 는 intermodal cities 에, Bangkok, Ho Chi Minh City, Jakarta, Tokyo 등은 maritime cities 에, 부산, 인천 등은 gateways 로 분류할 수 있었다. 차하 결절지에 속하는 울산은 general city 에 속하였다.

정량적 분석에 이어 정성적 분석을 시도하였는데, 유럽사례에 대한 정성적 분석에 비하면 제 5 장에서의 정성적 분석은 우리나라 인천과 부산에 한해 행해졌다. 정성적 분석의 항목과 접근방식은 유럽 사례에서와 동일하였다(그림 5-1, 5-2, 5-3, 5-4, 5-5).

마지막으로, 유럽 항만도시와 아시아 항만도시를 하나의 모집단으로 묶어 총 127 개 도시에 대해 요인분석을 하였다. 이는 유럽 항만도시와 아시아 항만도시에 대한 더욱 직접적인 비교를 위함이었는데, 네 개의 주요 요인을 추출하고(표 5-6) 이를 토대로 127 개 항만도시를 4 개의 유형으로 분류하였다(표 5-7, 5-8).

네 개의 요인은 아시아의 경우에서와 같은 형태로 볼 수 있다. 사례 항만도시의 규모(concentration, F1), 도시규모와 항만특화 간의 대조(opposition, F2), 육상-해운 접근성과 3 차 산업 유인력으로의 특화(specialization, F3), 항만자체의 결정성과 도시로서의 연결성을 보여주는 조합(combination, F4) 등으로 해석될 수 있는데, 여기서 개별

요인에 대한 최종 해석 내용은 아시아 항만도시와는 유사하나, 각 요인을 구성하는 변수들의 내용과 그 중요성에 있어서는 약간의 차이가 있었다. 특히 F3(<0)과 F4(<0)을 특징짓는 가장 중요한 변수가 아시아의 경우와 같지 않았는데(표 5-6), 이는 전반적으로 유럽 항만도시들보다 아시아 항만도시들의 인구가 더 많기 때문인 것으로 사료된다.

교차분석 결과를 종합한 결과(표 5-7), 가장 두드러지는 유럽-아시아 항만도시 간 패턴 차로 다음 2 가지를 꼽을 수 있었다. 먼저 F3 항만 특화에 있어서 유럽의 항만들과 아시아의 항만들이 거의 분리되어 있는 것이다. 이는 F3 요인을 지도로 나타낸 지도 5-9 에서도 잘 드러나는데, 다시 말해 유럽 항만도시는 sea-land accessibility, 아시아의 항만도시는 tertiary attractivity 기능으로 특화하여 있다. 다음은 유럽과 아시아라는 두 대륙 차원에서의 서로 유사한 항만도시 그룹에 관한 것으로서, 주로 F2 요인과 F4 요인과 관련이 된다. 북유럽 항만도시들은 일본을 제외한 아시아 항만도시들(또는 동남아시아 항만도시들), 남유럽의 항만도시들은 일본의 항만도시들 (또는 동북아 항만도시들)과 비슷한 유형을 보인다고 할 수 있겠다.

이상의 결과들을 토대로 유럽과 아시아의 항만도시를 4 가지 유형으로 다시 분류할 수 있겠는데, 이 결과(표 5-8)는 대륙별 유형분류 결과와 반드시 일치하지 않는 것으로 나타났다. 즉 General cities 와 maritime cities 유형에 속한 항만 도시들에는 변화가 거의 없었으나, intermodal cities 와 gateways 유형에 있어서는 앞의 대륙별 분석 결과가 유럽-아시아 통합분석 결과와 반드시 같지 않았다. 대륙별 분석에서는 gateways 였으나 종합분석결과 intermodal cities 로 분류된 도시들은 인천, Tianjin, Qingdao, Taichung 등 주로 아시아 항만도시들(특히 우리나라 서해안을 둘러싼 항만도시들)임에 반해, 대륙별 분석에서 intermodal cities 로 분류되었으나 종합분석에서는 gateways 로 분류된 도시들은 Rotterdam 과 남부유럽의 Marseilles, Valencia 등 주로 유럽의 항만도시였다. gateways 가 항만 기능면에서 볼 때 가장 효율적인 유형임을 고려하면, 이러한 변동은 아시아 항만도시들이 유럽 항만도시들에 비해 그 효율성과 경쟁력에서 열세이기 때문에 나타난 현상으로 해석할 수 있을 것이다.

제 6 장 결론: 정책적 함의

결론인 제 6 장에서는 유럽과 아시아의 항만도시에 대한 몇 가지 정책적 함의를 중점적으로 다루고 있다. 먼저 광역 수준에서는 도시와 항만기능 간의 균형을 강조하여, 하나의 항만도시가 도시위계와 항만위계 모두에 있어

적절한 위치를 차지하는 것의 중요성을 논하고 있다. 특히 인천, 부산 같은 한국의 항만도시들은 지역경제에서 항만관련 변수들이 갖는 비중이 월등히 큰데, 이는 항만기능이 높아서 라기보다는, 서울집중의 영향으로 도시자체의 경제 규모가 상대적으로 낮기 때문으로 보아야 할 것이다. 따라서 항만기능의 크기에 맞게 도시경제 자체의 내용과 총량을 높여야 할 것으로 판단된다.

국지수준에서의 정책적 함의로서는 항만과 도시간 공간·경제적 통합의 중요성을 들 수 있겠다. 한국의 경우 항만과 도시의 관리주체가 분리되어 있으며 도시와 항만을 동시에 포함하는 통합계획이 부족한데, 프랑스의 charte ville-port 같이 여러 주체들이 참여하여 수립하는 단일 개발계획이 필요할 것으로 생각된다.

본 연구의 가장 큰 한계로서는 유럽과 아시아 항만도시들의 성격에 대한 기술(description)에 치중하여, 해석과 설명이 부족하였다는 점을 들 수 있을 것이다. 통계자료 구득의 한계로 인해 요인분석에 몇 개의 한정된 변수들만을 활용하였으며, 분석의 공간단위가 대륙(유럽, 아시아)이었던 관계로 이보다 좁은 소권역이나 도시 수준에서의 논의가 부족하였다. 그럼에도 불구하고 본 연구는 유럽과 아시아의 항만도시를 항만기능과 도시공간과의 상호관계에 초점을 두어 비교 분석한 매우 드문 시도 중의 하나로서, 특히 요인분석 결과나 항만도시 유형분류, 지도자료 등은 후속연구에 좋은 참고자료가 될 수 있을 것으로 생각된다.

R · E · F · E · R · E · N · C · E

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A · N · N · E · X

ANNEX

<Annex 1-1> Sources and units of indicators

Indicator	Code	Source	Unit
Container-related activities	CONBUS	Containerisation International	Total number of companies
Regular containerised direct calls	DIRCAL	Containerisation International	Total number of services
International forwarding and logistic agents	FORBUS	Journal for International Transport	Total number of companies
Highways connecting the port city	HIGHWA	Microsoft Mappoint	Total number of highways
Maximum depth of the container terminals	MAXDEP	Containerisation International	Meters
Surface of the metropolitan area	METARE	Ducruet (2004)	Square kilometres (sq. km.)
Population of the administrative area	POPADM	World Gazetteer, Geopolis, Populstat, Citypopulation	Number of inhabitants
Population of the metropolitan area	POPMET	World Gazetteer, Geopolis, Populstat, Citypopulation	Number of inhabitants
Population of the suburban area	POPSUB	World Gazetteer, Geopolis, Populstat, Citypopulation	Number of inhabitants
Total length of quays	QUALEN	Lloyd's Ports of the World	Meters
Number of railways connecting the port city	RAILWA	Microsoft Mappoint	Total number of railways
Length of container-related terminals	TERLEN	Containerisation International	Meters
Container throughput	TEUTRA	Containerisation International	Twenty-Foot Equivalent Units (TEUs)

<Annex 1-2> Database on European port cities

PORT CITY	QUALEN	TEUTRA	DIRCAL	TERLEN	MAXDEP	POPADM	POPMET	POPSUB	METARE	HIGHWA	RAILWA	FORBUS	CONBUS
AARHUS	16 445	500 000	15	1 500	14	226	226	0	79	1	4	1	48
ALICANTE	3 858	146 477	4	354	10	327	428	101	36	0	3	12	14
AMSTERDAM	23 405	44 511	28	5 360	14	745	1 188	443	107	5	7	13	26
ANTWERPEN	126 998	6 063 746	374	16 190	16	459	933	474	96	8	5	26	189
BARCELONA	23 768	1 882 878	136	4 370	14	1 570	4 973	3 403	141	5	7	79	81
BARI	3 295	35 000	6	990	10	303	303	0	20	1	5	3	5
BELFAST	5 595	229 000	11	747	9	464	585	121	30	3	4	1	26
BERGEN	12 986	110 359	8	310	10	213	213	0	59	1	1	1	33
BILBAO	12 902	468 960	43	2 118	21	349	1 120	771	52	3	7	15	43
BORDEAUX	5 310	46 385	10	690	12	219	971	752	88	3	7	9	9
BREMEN	19 004	3 469 104	54	4 040	15	546	1 001	455	221	5	6	26	105
BREST	2 945	19 917	1	400	11	144	213	69	87	2	1	1	6
BRISTOL	7 950	100 493	10	1 050	14	430	616	186	156	5	6	5	10
CADIZ	6 547	150 909	11	580	12	137	407	270	11	0	1	1	22
CAGLIARI	4 424	28 432	60	1 520	14	199	292	93	5	0	2	0	8
CARDIFF	554	41 461	3	250	9	302	720	418	17	3	4	1	6
CARTAGENA	6 612	27 523	3	1 280	13	201	201	0	10	0	2	0	6
CASTELLO	2 332	35 041	8	167	12	164	290	126	3	0	3	1	3
CATANIA	2 450	0	7	290	12	307	852	545	14	2	3	0	3
COPENHAGEN	38 257	135 000	10	375	10	1 089	2 366	1 277	150	5	6	5	77
DUBLIN	6 274	540 779	37	1 087	11	495	1 024	529	247	5	4	14	53
EDINBURGH	3 542	169 300	6	320	8	435	696	261	32	3	3	1	7
GDANSK	10 537	24 074	6	275	10	461	867	406	60	1	2	3	9
GENOA	22 576	1 628 594	143	9 993	15	585	692	107	24	3	4	20	126
GIJON	6 381	3 172	5	326	12	262	285	23	10	1	0	1	10
GLASGOW	4 015	34 200	5	376	13	610	1 379	769	86	9	10	7	23
GOTENBURGH	6 841	731 000	26	1 603	12	515	786	271	65	3	7	6	90
HAMBURG	35 000	7 003 479	318	9 553	17	1 733	3 278	1 545	231	9	6	42	296
HELSINKI	9 115	500 000	31	415	11	558	1 215	657	108	8	2	15	76
KIEL	4 718	27 454	4	1 070	10	235	235	0	9	4	4	0	5
KINGSTON UPON HULL	1 239	292 345	17	300	10	302	302	0	26	2	3	2	27
LA CORUNA	4 366	8	3	400	11	236	387	151	10	1	2	0	2
LE HAVRE	16 713	2 150 000	242	6 075	15	188	254	66	24	2	2	19	67
LEIXOES	6 135	331 741	51	900	12	249	1 218	969	77	4	4	27	27
LISBON	4 249	514 679	72	1 883	14	517	2 613	2 096	170	3	3	30	75
LIVERPOOL	12 452	578 000	21	707	13	468	3 562	3 094	473	5	10	2	38
LONDON	9 460	1 132 700	138	2 100	16	7 421	11 327	3 906	408	15	24	60	213
LUBECK	2 415	78 778	10	647	10	213	213	0	63	3	5	1	12
MALAGA	3 888	70 000	8	236	9	557	843	286	10	2	3	1	10
MALMO	1 500	135 000	2	1 050	9	261	598	337	21	5	4	1	8
MARSEILLES	12 492	916 000	60	2 750	14	792	1 573	781	174	3	3	20	68
MESSINA	1 761	61 449	0	165	11	237	237	0	4	1	2	0	2
NANTES	2 531	119 385	2	1 593	13	284	765	481	226	5	5	8	3
NAPLES	8 646	430 000	49	374	14	981	3 770	2 789	155	3	8	10	35
NEWCASTLE UPON TYNE	4 630	44 937	3	514	11	192	1 428	1 236	54	5	6	0	4
OSLO	11 772	177 019	11	563	10	508	808	300	175	5	5	9	92
PALERMO	3 714	20 000	11	700	15	669	987	318	20	2	2	1	11
PALMA	4 329	183 300	1	1 070	11	378	475	97	11	0	2	0	15
PIRAEUS	19 816	1 605 135	64	3 100	17	172	3 231	3 059	370	2	3	50	209

RIGA	13 090	150 000	10	450	10	742	843	101	84	2	6	4	37
ROSTOCK	9 000	1 683	2	143	9	202	205	3	8	2	5	0	11
ROTTERDAM	39 027	8 281 000	462	10 250	17	603	3 328	2 725	118	7	5	30	211
ROUEN	12 690	126 468	25	2 040	12	112	535	423	171	3	4	4	16
SALERNO	2 221	329 760	47	1 654	11	144	533	389	21	3	3	3	9
SANTANDER	4 881	10 007	1	839	13	182	229	47	5	2	3	1	6
SEVILLA	3 802	102 854	4	760	7	686	1 312	626	17	5	4	6	10
SOUTHAMPTON	8 430	1 441 012	83	1 350	15	246	764	518	61	3	6	1	42
STOCKHOLM	14 015	33 550	3	240	9	1 253	1 692	439	441	6	6	2	27
SZCZECIN	7 672	14 008	1	125	9	413	505	92	15	1	5	2	18
TALLINN	10 428	111 599	7	400	13	394	394	0	67	2	4	6	47
TARANTO	6 682	763 318	15	1 500	14	217	255	38	17	1	5	1	5
TARRAGONA	10 920	53 086	3	489	14	128	357	229	5	2	3	2	11
TEES	3 104	318 587	13	660	11	363	675	312	31	4	6	0	17
THESSALONIKI	5 860	336 096	31	600	12	354	829	475	68	3	1	18	25
TRIESTE	4 652	131 200	21	1 420	18	201	201	0	86	2	3	6	22
VALENCIA	8 937	2 145 236	120	4 039	16	769	1 740	971	67	2	7	28	63
VALLETTA	2 821	51 666	7	352	12	6	258	252	4	0	0	5	30
VENICE	5 802	283 667	21	510	12	259	259	0	9	0	1	8	19
VIGO	3 088	161 952	30	1 021	17	286	419	133	27	2	3	4	18

<Annex 1-3> Database on Asian port cities

PORT CITY	MAXDEP	POPADM	POPMET	TEUTRA	HIGHWA	RAILWA	DIRCAL	TERLEN	QUALEN	CONBUS	FORBUS	POPSUB	METARE
BANGKOK	11	6 320	8 838	1 073 517	6	4	85	3 417	7 655	107	37	2 518	595
BATANGAS	5	25	247	2 566	0	2	1	342	573	2	0	222	20
BELAWAN (MEDAN)	11	107	3 800	273 704	0	1	46	850	4 477	24	4	3 693	70
BUSAN	15	3 662	4 298	7 540 387	5	2	547	11 040	12 123	52	9	636	156
CAGAYAN DE ORO	11	444	461	148 482	0	0	2	300	954	3	0	17	16
CEBU	9	776	1 223	404 116	0	2	21	1 141	1 141	21	4	447	98
CHENNAI	15	4 216	6 677	321 960	2	3	40	600	4 953	55	18	2 461	177
CHIBA	12	887	31 139	57 535	6	5	7	240	17 674	302	0	30 252	879
CHITTAGONG	9	2 199	2 592	324 147	0	3	19	450	3 150	33	14	393	16
CHIWAN (SHENZHEN)	15	0	1 500	400 000	0	0	75	1 270	2 520	6	0	1 500	0
COCHIN	11	596	1 408	133 178	0	0	20	680	2 802	32	1	812	20
COLOMBO	15	642	2 436	1 732 855	0	3	193	2 546	6 544	71	21	1 794	38
DALIAN	14	1 735	3 221	1 011 000	0	2	91	1 173	16 277	31	7	1 486	157
DAVAO	11	951	1 195	145 372	2	0	17	250	2 591	12	1	244	4
FANGCHENG	14	132	744	5 000	2	0	2	500	2 116	1	0	612	11
FUZHOU	14	1 024	1 546	400 200	2	2	18	1 050	3 447	15	1	522	32
GENERAL SANTOS	11	250	411	115 363	0	0	2	588	1 191	7	0	161	63
HACHINOHE	13	241	241	25 673	3	2	7	530	4 491	1	0	0	5
HAIPHONG	8	591	1 820	219 000	0	1	16	342	2 481	22	7	1 229	16
HAKATA (FUKUOKA)	13	1 341	4 200	510 721	5	7	85	840	9 777	9	1	2 859	29
HO CHI MINH CITY	10	2 899	5 894	733 236	2	3	80	486	2 579	44	24	2 995	108
HONG KONG	15	1 374	8 190	18 100 000	0	2	716	6 791	19 364	274	83	6 816	44
INCHEON (SEOUL)	14	2 475	21 738	611 261	2	1	43	9 585	13 597	14	2	19 263	28
JIUZHOU (ZHUHAI)	9	205	371	235 000	0	0	3	700	1 500	0	0	166	4
KAOHSIUNG	15	1 493	2 557	7 425 832	2	2	297	6 047	21 346	56	6	1 064	21
KARACHI	11	9 269	10 537	615 024	1	1	69	600	6 655	61	23	1 268	428
KAWASAKI	14	1 249	31 139	43 707	5	6	14	431	11 670	302	0	29 890	1 895
KEELUNG (TAIPEI)	12	410	8 030	1 954 573	1	2	178	3 192	8 440	24	0	7 620	2
KITAKYUSHU	12	1 011	4 193	412 043	5	7	38	1 895	17 424	6	0	3 182	98
KOBE	15	1 493	17 621	2 265 992	3	5	285	11 205	39 296	113	0	16 128	531
KUANTAN	12	289	289	62 783	0	0	12	620	2 205	12	1	0	38
KUCHING	11	423	423	110 474	0	0	14	1 248	1 466	13	1	0	41
MANILA	15	1 581	13 790	2 867 836	2	3	167	8 278	11 227	82	12	12 209	584
MUMBAI	11	11 914	16 368	429 448	2	1	31	1 388	12 500	145	31	4 454	240
NAGOYA	15	2 171	8 610	1 911 920	10	14	312	3 555	34 680	31	1	6 439	115
NAHA	11	301	302	303 337	1	0	17	540	3 645	4	0	1	2
NINGBO	14	506	1 399	902 000	2	2	2	900	1 730	16	3	893	11
OSAKA	14	2 598	17 621	1 474 201	13	18	234	3 765	26 328	113	6	15 023	531
PENANG	12	180	1 033	635 780	0	0	46	931	2 670	31	8	853	59
PORT KLANG	15	631	6 139	3 206 753	0	2	367	4 379	7 692	57	14	5 508	44
QINGDAO	16	1 487	2 536	2 120 000	0	1	162	1 000	8 001	34	7	1 049	67
SHANGHAI	13	9 110	12 039	5 613 000	2	5	322	2 281	14 308	111	27	2 929	286
SHIMIZU	12	236	236	361 700	4	3	40	1 160	9 155	18	0	0	19
SINGAPORE	15	3 499	4 591	17 040 000	1	1	612	5 919	19 031	278	42	1 092	153
TAICHUNG	14	989	2 131	1 130 357	0	3	55	2 437	10 397	22	4	1 142	18
TANJUNG PERAK	11	3 092	3 788	949 029	2	3	54	1 450	8 341	34	11	696	49
TANJUNG PRIOK	14	8 987	17 891	2 222 496	3	4	24	2 338	9 219	103	24	8 904	283
TIANJIN	15	4 384	6 809	1 708 423	2	4	54	2 450	11 243	35	10	2 425	135

TOKYO	15	8 134	31 139	2 899 452	12	20	234	4 321	16 665	302	18	23 005	1 895
TUTICORIN	12	216	252	136 612	0	1	30	283	883	28	2	36	16
ULSAN	12	1 014	1 155	236 296	1	3	53	240	12 900	8	1	141	5
VISAKHAPATNAM	10	969	1 381	20 427	0	2	4	168	4 326	11	1	412	12
VLADIVOSTOK	12	606	646	70 000	1	1	5	303	4 200	7	0	40	49
XIAMEN	13	464	738	1 084 700	0	1	112	972	2 756	30	8	274	6
YANGON	8	4 344	4 344	49 453	0	3	9	500	2 409	19	2	0	109
YOKKAICHI	13	291	291	103 500	4	5	30	550	6 190	3	0	0	6
YOKOHAMA	16	3 426	31 139	2 317 489	6	6	344	6 030	37 537	302	2	27 713	1 895